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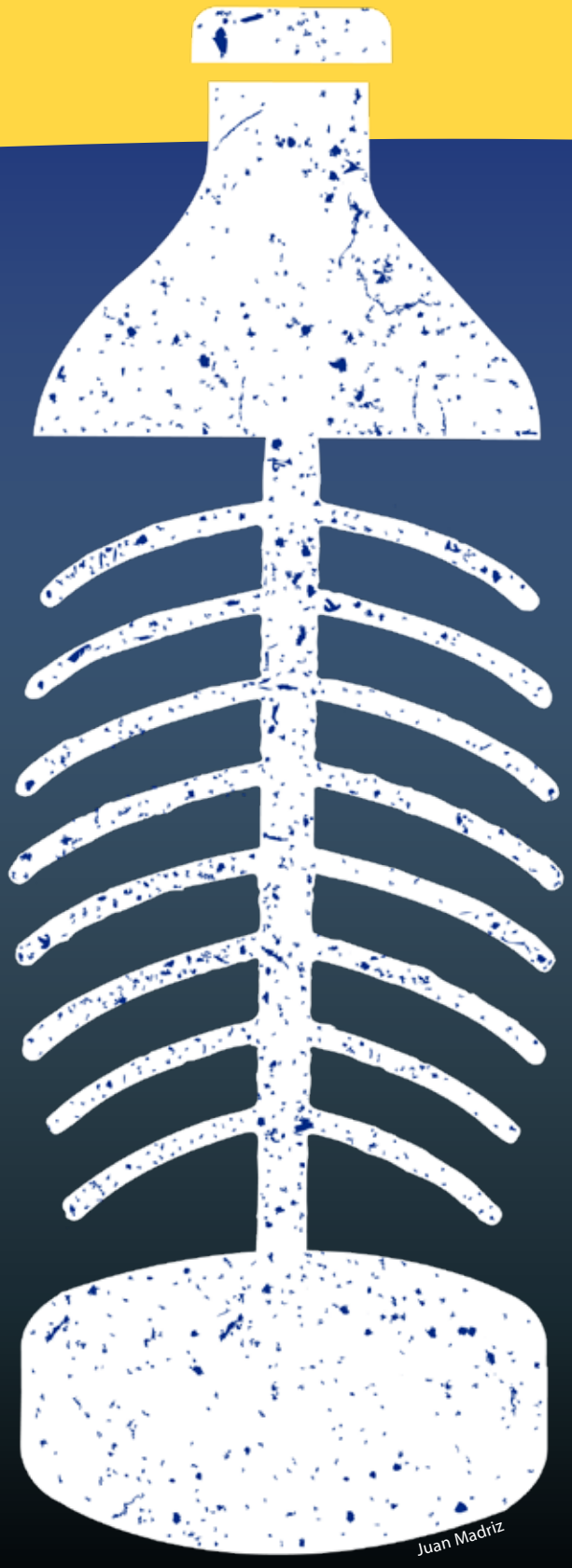
Juan Madriz

The ocean: Time to turn the tide

- **Ghana**'s coastline, swallowed by the sea
- In **Tahiti**, a lagoon rescued by tradition
- **Latin America** declares a war on plastic
- Green turtles return to the **Seychelles**

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THE UNESCO Courier

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Editorial

Less than twenty per cent of the world's oceans have been explored so far. That is not a lot. But it is enough for us to know that the oceans are threatened by global warming, acidification, and pollution. Coral bleaching is just one illustration of the decline of marine ecosystems. The consequences are not just environmental. Nearly three billion people depend directly on marine and coastal biodiversity for their survival. By 2050, coastal areas that are home to 300 million people could be threatened by rising sea levels due to climate change.

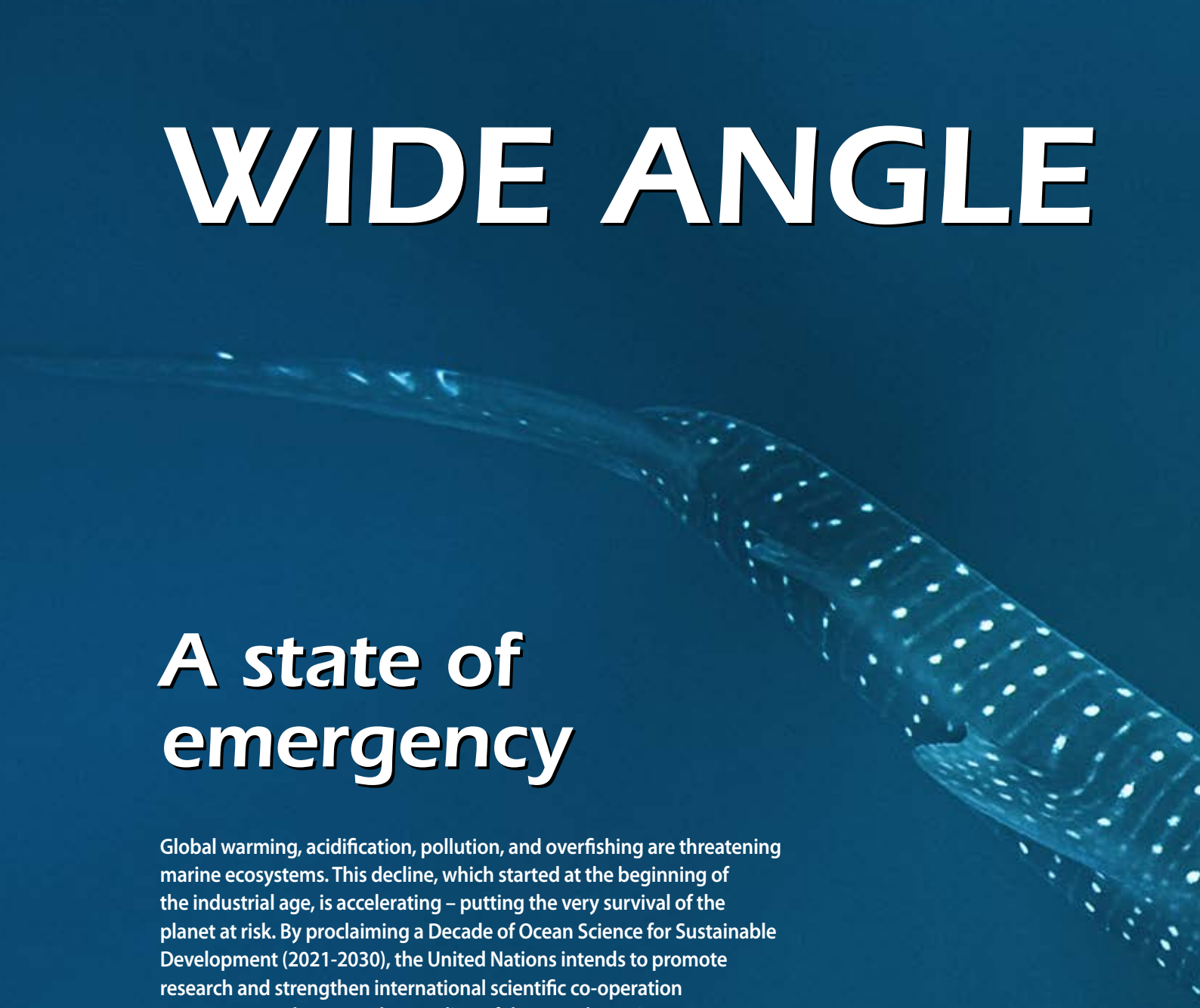
The United Nations Decade of Ocean Science for Sustainable Development (2021-2030) gives us an opportunity to remind ourselves of these major challenges, and to share the innovative solutions that emerge. It is also intended to draw attention to the crucial role of research in improving our understanding of the ocean, and strengthening its resilience. Provided that it is given the means to do so. According to the second *Global Ocean Science Report 2020* published by UNESCO's Intergovernmental Oceanographic Commission (IOC), Member States spend an average of only 1.7 per cent of their research budgets on ocean sciences.

By absorbing nearly a third of carbon dioxide emissions, oceans play a decisive role in regulating the climate. As a source of life, they are therefore crucial to the very fate of humanity. This is why oceans have long played a central role in international co-operation.

The establishment of the Pacific Tsunami Warning and Mitigation System (TWS) in 1965, under the auspices of UNESCO, is a striking example of this. This system, which has served as a model for subsequent mechanisms set up in other regions of the world, has been a great success. It is proof that, in the face of major threats, the international community is able to transcend differences and work together for the common good. All the more reason to mobilize for the protection of oceans today.

Agnès Bardon

WIDE ANGLE



A state of emergency

Global warming, acidification, pollution, and overfishing are threatening marine ecosystems. This decline, which started at the beginning of the industrial age, is accelerating – putting the very survival of the planet at risk. By proclaiming a Decade of Ocean Science for Sustainable Development (2021-2030), the United Nations intends to promote research and strengthen international scientific co-operation to encourage a better understanding of the complex universe that is the ocean. It also aims to find more sustainable ways to exploit its resources. But time is running out. Sixty-six per cent of the marine environment has already been severely altered by human activity.

Agnès Bardon

UNESCO

The plastic foam that floats on the ocean surface, even miles away from the coast, may be the most spectacular symptom, but is just one indicator of the poor health of the marine environment. In study after study, the diagnosis is clear: the oceans – which cover seventy-one per cent of the world's surface – are becoming warmer, more depleted, and more acidic.

Today, the question is no longer whether these phenomena are causing major upheavals, but rather, at what rate these will occur. The stakes are high, involving the survival of some three billion people who depend directly on the sea for their livelihoods. More broadly, the very future of the planet is at stake.

The oceans act as the lungs of the earth, producing part of the oxygen we breathe. By absorbing most of the excess heat generated by greenhouse gas emissions since the beginning of the industrial era, they also play a major role in regulating the climate. →

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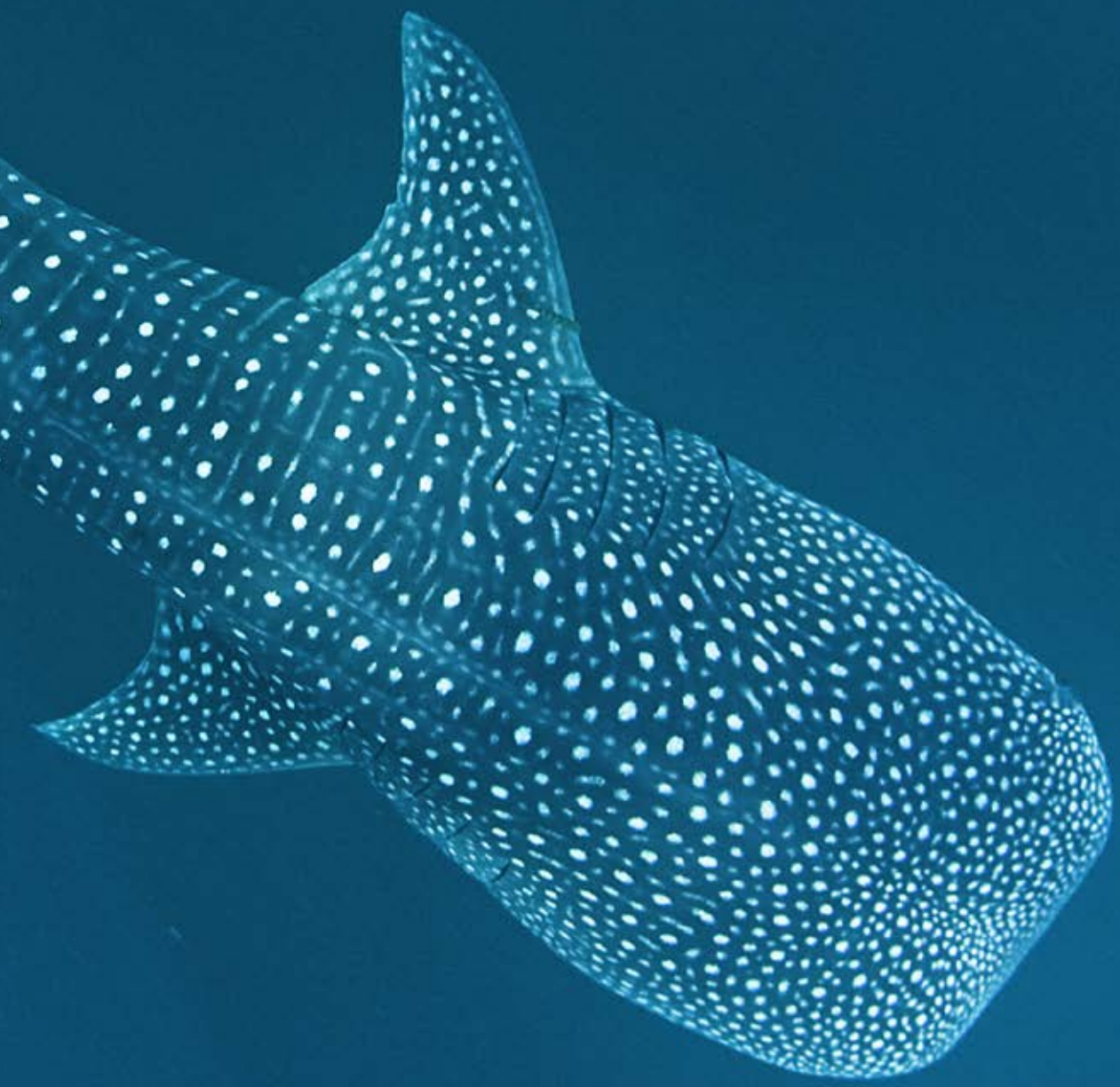
Oceans:
Time to turn the tide



The whale shark, the world's largest fish, is an endangered species.

Proliferation of dead zones

Figures from the *Special Report on the Ocean and Cryosphere in a Changing Climate*, published by the Intergovernmental Panel on Climate Change (IPCC) in 2019, show that the rate at which the ocean is warming has more than doubled since 1993, compared to the previous twenty-five years.

The warmer the water, the less oxygen can dissolve in it. Exacerbated by agricultural pollution, this phenomenon results in a proliferation of dead zones – areas deprived of oxygen and deserted by marine species. On the high seas, these zones have quadrupled in fifty years. As a result, living organisms that can move, tend to migrate towards the poles. Those that do not have this option, like corals, are condemned to suffer the consequences of heat stress and degradation. A warmer ocean also means more water vapour, a change in the cloud cycle, and an intensification of extreme weather events such as droughts or heavy rainfall.

Warming also leads to thermal expansion of the water, causing a rise in sea levels, which are also exacerbated by the melting of glaciers. According to the IPCC's most optimistic scenario, the rise in sea levels could reach 0.59 metres by the end of the century. This poses a direct threat to the 65 million people living in Small Island Developing States (SIDS) and the around 680 million people living in areas that are less than ten metres above sea level.

By absorbing nearly a third of carbon dioxide emissions released by humans, the oceans have allowed the atmosphere to remain breathable – but at the cost of altering the chemical composition of the water. Marine organisms with calcium carbonate shells, especially those that make up plankton – which are at the bottom of the food chain – are further weakened by water that has become more acidic.

Only **19%** of the ocean floor has been **mapped** in high resolution

Source: The Nippon Foundation-GEBCO Seabed 2030 Project

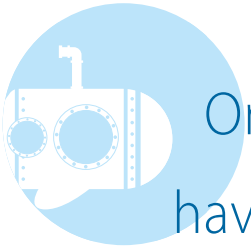
Nearly **1 million** marine species could still be **unknown to science**

Source: *The United Nations Decade of Ocean Science for Sustainable Development (2021-2030)*, 2018

Marine ecosystems pay a heavy price for this. Already, sixty-six per cent are "severely affected" by human activities, according to a 2019 report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). As of now, half the surface area covered by coral reefs has disappeared since 1870, and crucial ecosystems such as mangrove forests have been reduced to less than twenty-five per cent of their extent.

An unexplored world

This state of affairs is now relatively well-known. What is less well-known are the cumulative effects of all these phenomena caused by human activities on the state of the oceans. Much remains to be discovered about this underwater world, of which barely five per cent has been explored so far. This is precisely what the ocean sciences are working on – deciphering this complex universe of marine ecosystems and their interactions with the atmosphere.



Only **57 countries** have designated national **oceanographic data centres***

Women account for **39%** of global ocean scientists, **10% higher** than the global share of female researchers in natural sciences*

Bringing together disciplines such as physics, biology, chemistry, geology, hydrography, health sciences, engineering, and the social sciences, ocean sciences are also essential for planning the rational management of marine resources. This is one of the Sustainable Development Goals (SDGs) for the 2030 Agenda adopted by the United Nations: "Conserve and sustainably use the oceans, seas and marine resources" (Goal 14).

But probing the oceans requires research vessels, the use of satellite images, and recourse to underwater robots. All of these technologies require major investments. However, according to the *Global Ocean Science Report* (GOSR) of UNESCO's Intergovernmental Oceanographic Commission (IOC), national spending on ocean sciences represents only 1.7 per cent of national research budgets on average, ranging from 0.03 per cent to 11.8 per cent.

The UN Decade of Ocean Science for Sustainable Development (2021-2030) aims to raise awareness of the need to strengthen and diversify sources of funding for these disciplines. It also aims to facilitate international co-operation in the study of the oceans; to identify gaps in scientific programmes; co-ordinate research programmes and marine spatial planning, and reduce marine-related risks to improve the management of ocean resources and coastal zones.

The means to act do exist. Conservation efforts, when carried out successfully, bear fruit. Endangered species, like the fin whale and the grey whale, have seen their populations increase, thanks to international bans on commercial whaling and reduced catches. By using scientific research, and drawing on indigenous knowledge, it is still possible to change our practices to conserve resources and improve the resilience of marine environments. This can be done by regulating fishing and developing marine-protected areas – but only if the harmful mechanism of global warming is halted. It is at this price that a future is possible for the ocean, and therefore, for the planet.

From 2012 to 2017, **61 %** of the papers published by ocean scientists were **international collaborations***

On average, only **1,7 %** of national research budgets **support ocean sciences***

* Source: *The Global Ocean Science Report 2020*

Scott Kulp: "Sea level rise is a near-term danger"

The number of people at risk from rising sea levels could be three times higher than previously estimated, according to research by Climate Central, an independent climate science and news organization based in Princeton, New Jersey. Scott Kulp, Senior Computational Scientist and Senior Developer for Climate Central's Program on Sea Level Rise, and lead author of the 2019 study, used artificial intelligence to analyse this phenomenon – which could push millions of people into exile as early as in 2050.

Interview by Shiraz Sidhva

The UNESCO Courier

● ***According to your study,* Flooded Future: Global Vulnerability to Sea Level Rise Worse Than Previously Understood*, coastlines across the world are more exposed than was previously thought. Were you surprised by the results?***

We expected our study to reveal more risk worldwide, but not to the extent we saw. Our findings show that within thirty years, coastal flooding can be expected at least annually on land that is currently home to 300 million people. And 150 million people live on land expected to fall below the high tide line by 2050, meaning that without coastal defences, those places could be practically uninhabitable.

Under a higher-emissions scenario, and near the tail-end of sea-level rise sensitivity to warming for the model used in this study, land that is home to about ten per cent of the world's population could be threatened by the end of the century, either by chronic flooding or permanent inundation.

● ***By how much are global sea levels expected to rise in the twenty-first century?***

By the end of this century, most projections show sea levels increasing by half-a-metre to one metre, with an accelerating rate of rise, and that would accompany more frequent and more severe coastal floods.

Our study found that cutting global carbon emissions roughly as proposed in the Paris Agreement could, by the end of this century, prevent the risk of annual coastal floods and permanent inundation from expanding to land now home to thirty million people. But beyond that, this would reduce the danger of many other risks of climate change.

● ***Which regions will be most affected?***

Sea level rise is a global story, and it affects every coastal nation. But in the coming decades, the greatest effects will be felt in Asia, because of the number of people living in the continent's coastal areas. Bangladesh, China, India, Indonesia, Thailand and Viet Nam are home to the most people on land projected to be below average annual coastal flood levels by 2050.

Together, those six nations account for roughly seventy-five per cent of the 300 million people living on land facing the same vulnerability at mid-century.

Some countries have already taken drastic measures to respond to mounting coastal flood risk at least partly driven by sea level rise. Indonesia, for example, has taken the decision to move its capital from Jakarta to higher ground on the island of Borneo. As oceans continue to rise, large-scale initiatives like this will become more and more common.

Saint Mark's Square in Venice, Italy, November 2019, flooded by the second-highest acqua alta, *or high water, since records began in 1923.*

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A woman wades through a street in Bangkok's Pinklao district, during some of the worst floods to hit Thailand, which lasted several months in 2011.

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● ***How can the most affected coastal cities prepare themselves for the inevitability of rising seas?***

A number of cities throughout Asia – in Bangladesh, China, India, Indonesia, Viet Nam – include land whose elevation was determined by CoastalDEM to be lower than the local high tide line. That's probably an indication that natural or man-made defences like sea-walls, dykes and levees are allowing people to live there today.

You can see examples of these in Shanghai, as well as in the Netherlands and New Orleans, where extensive coastal flood control projects protect large cities. But as sea levels continue to rise, so will the cost to maintain and improve those defenses, and so will the cost of failure.

There are also examples of natural defences, like dunes and wetlands and distance from the coast. All of these are likely to be limiting the impact of coastal floods across vulnerable land today, but rising seas will inevitably reduce the protection they offer.

The risk is not limited to Asia. In France, Germany, and the United Kingdom; in Egypt, Iraq, and Nigeria; in Brazil and in the United States, low-lying land is home to large communities that will likely need more protection as the severity of coastal flooding increases.

● ***What is the current situation of the Small Island Developing States (SIDS)?***

Our research highlights the severity of the sea level rise risk faced by SIDS, many of which are under-equipped to invest in responses.

In the Maldives, roughly half of the population lives on land projected to fall below the tideline by 2100. In the Marshall Islands, that figure is roughly eighty per cent. As seas rise, coastal flooding in those areas will be more frequent and more severe, which could make them practically uninhabitable well before the end of this century.

These mounting threats are largely the result of wealthier nations' carbon emissions, and without those nations' support, SIDS' governments may not have the resources to help their residents adapt to rising seas.

● ***Your project, CoastalDEM, uses artificial intelligence (AI) instead of the satellite data used by previous NASA models. What does this new technology have to offer?***

Understanding the real threat posed by future sea level rise requires a better measure of the ground beneath our feet. That is the purpose of CoastalDEM.

Developed using machine learning, the new dataset is substantially more accurate than NASA's Shuttle Radar Topography Mission (SRTM), particularly in densely populated areas – precisely those places where the most people and structures are threatened by rising seas.

Our work can and should be improved upon, but for planners in many coastal nations, it represents the most accurate source available to assess the risks posed by rising seas.

● ***What are the most crucial steps that governments are being encouraged to take to mitigate the crisis?***

Assessing risk using the best resources available is the first, and most crucial step that governments can take to protect the people and places threatened by rising seas. But international efforts to reduce carbon emissions and global warming are essential to managing this risk because they can slow the pace of sea level rise and give vulnerable communities more time to plan and respond to this crisis.

If governments seek to limit future impacts from ocean flooding, they could also avoid new construction in areas at high risk of inundation, while protecting or relocating existing infrastructure and settlements.

Sea level rise is a near-term danger: today's communities must make choices not just on the behalf of future generations, but also for themselves.

Ghana's coastline, swallowed by the sea

With a coastline of 550 kilometres and a quarter of its population living by the sea, Ghana is particularly affected by coastal erosion. Human activities that amplify the rise in water levels linked to global warming are largely responsible for this.

Kwasi Addo Appeaning

Associate Professor in Coastal Processes and Delta Studies and Director of the Institute of Environment and Sanitation Studies at the University of Ghana, Accra.

Located on the edge of the Gulf of Guinea, near the town of Keta in the Volta region on Ghana's eastern coast, Fuvemeh was, until a few years ago, a prosperous fishing village living off the sea and its coconut plantations. Today it has been partly devoured by the sea.

By 2017, nearly eighty houses and a school building had been destroyed, and more than 300 inhabitants displaced. Farmlands and plantations were washed away, and the local fishermen lost their livelihoods. The situation has only worsened in the last three years, with the shoreline retreating several metres inland in some places, and by as much as 100 metres in others.

Using a drone equipped with a high-definition camera, my colleagues and I recorded aerial videos and images between August 2016 and June 2017. Comparing these with satellite images from 2014 and photographic maps from 2005, we observed that thirty-seven per cent of the coastal land had been lost to erosion and flooding between 2005 and 2017.

The construction of the 8,502-square-kilometre Akosombo dam on the Volta River in 1965, and the recent expansion of the Tema port have impacted sediment flow. This has contributed significantly to increased erosion along the eastern coast. Sand mining, an illegal practice that continues because of a lack of law enforcement, has also been identified as a major cause of erosion on the Ghana coast.

Villages that have become islands

The Volta region is far from being the only one affected by coastal erosion. The entire West African coastline is impacted, to varying degrees. Ghana, with its 550-kilometre coastline, is particularly vulnerable. Although the coastal zone constitutes about seven per cent of the country's total land area, it is densely populated – a quarter of its 31 million inhabitants live along the sea. In recent decades, heavy waves and floods have eaten into the shoreline, and turned some fishing villages into islands.

Ghana's economic success over the last decade has come at a price, particularly for the country's coastline. About eighty per cent of its industrial activities such as oil and gas production, port operations, and

> "Thirty-seven per cent of coastal land has been lost to erosion and flooding between 2005 and 2017"

© Matilde Gattoni

Situated on a narrow strip of land between the Atlantic ocean and the Volta river estuary, the fishing village of Fuvemeh is literally being swallowed up by the sea.

© Matilde Gattoni

View of the harbour from the Cape Coast Castle, a fort on UNESCO's World Heritage List, 200 kilometres west of Accra.

the generation of thermal and hydroelectric power, are concentrated along the coast, in addition to coastal agriculture and fishing.

Unregulated human activities have greatly accelerated the problem of coastal erosion – a natural ongoing process by which coastlines adapt to varying sea levels, the energy levels of the tides and currents, sediment supply, and the existing topography over hundreds of years.

Ghana's western coast, which extends from Cape Three Points to New Town – adjacent to the border with Côte d'Ivoire – is the least affected by coastal erosion so far. This is because of the relatively low wave action and the presence of rocky beaches on this section of the coast. However, the high infrastructure development due to oil and gas production and an influx of people seeking employment in this area could cause changes in the coastal ecology systems.

An endangered heritage

The phenomenon is all the more worrying, as the impact of erosion along the Ghana coast is only likely to get worse with climate change and rising sea levels. Currently, the country's coastline is eroding at an average rate of about two metres a year. But some smaller sites have recorded up to seventeen metres of erosion in a single year.

The 150-kilometre eastern coastline, which stretches from Aflao to Prampram, has been identified as the most vulnerable. This is due to the influence of the dynamics of the delta system of the Volta river, which is characterized by relatively strong waves and currents.

Increasing threats from coastal erosion was one of the factors that influenced the relocation of the office and residence of Ghana's President from the Christiansborg Castle to the Flagstaff House in Accra in 2013. Other national landmarks, including the Independence Square and the Kwame Nkrumah Mausoleum in downtown Accra, and UNESCO World Heritage sites Forts and Castles in the Volta, Greater Accra, Central and Western Regions – the remains of fortified trading posts erected between 1482 and 1786 – are in danger of being claimed by the encroaching sea in the next century.

Cultural heritage sites such as Fort Kongensten – a historic Danish Fort constructed at Ada in 1783 – have been completely washed away, while parts of Fort Prinsensten, built at Keta in 1734, have been destroyed by coastal erosion.

In addition, nesting sites of endangered marine turtles in Ada and Totope and habitats of migratory birds are being destroyed. Natural landing sites used by traditional fishermen are also eroding, threatening traditional livelihoods. The collapse of the once-thriving small-scale coconut industry shows the effect of erosion on coastal vegetation.

Using drones to monitor coastlines

Faced with the scale of the threat, the authorities have reacted. Ghana's National Environmental Policy now mentions marine and coastal degradation as one of the country's environmental challenges. The government has constructed heavy engineering structures such as sea-walls at key points along its shore to stabilize the coastline. Six groynes – low broad walls of concrete or masonry running out into the sea – have also been built as part of the Keta Sea Defence Project.

However, these structures could eventually aggravate erosion in other parts of the coast. It is necessary to go beyond these reactive measures. In order to combat erosion effectively, more emphasis needs to be placed on prevention. An effective mechanism for risk monitoring is crucial for developing strategies and protecting coastal communities. Drones, which are low-cost and easy to operate, could be deployed as early warning systems. This would help vulnerable populations to be better prepared for storms and floods, which have increased in frequency in recent years.

At the same time, a more comprehensive coastal erosion management strategy needs to be put in place. Providing coastal protection should not be seen only as the first line of defence, but should be accompanied by measures to promote the adaptation of human activities and the restoration of coastal ecosystems. It would be more effective to encourage the resilience of the regions affected by erosion than to fight against nature.

> "Cultural heritage sites such as Fort Kongensten have been completely washed away"

Twenty thousand sounds under the sea

For a long time, we believed the ocean was a silent world. On the contrary, sounds play a crucial role for many marine organisms. But the noise generated by human activities is jeopardizing the survival of certain species. Michel André, acoustician and director of the Laboratory of Applied Bioacoustics (LAB) at the Technical University of Catalonia in Barcelona, warns of the dangers of this noise pollution.

Interview by Laetitia Kaci

UNESCO

● ***Does the ocean produce noise?***

In the ocean, sound is synonymous with life. Since light does not penetrate more than a few metres below the surface, it is the only medium of information the inhabitants of the sea have at their disposal to communicate.

But it is only in the last twenty years or so that we've fully realized the importance of these sounds. In fact, since the human ear is not designed to hear underwater, the sounds under the sea have long been ignored – as shown in *The Silent World,* the 1956 documentary directed by Jacques-Yves Cousteau and Louis Malle.

Today, thanks to the development of new devices, such as hydrophones, that are capable of capturing underwater sounds, we can now confirm that the sea is a world of 20,000 sounds. These are essential to marine life.

This discovery has also opened our eyes to the intensity of noise produced by human activities. For over eighty years, since the beginning of the industrial exploitation of marine resources by humans, we have unknowingly been polluting the ocean acoustically.

● ***What are the consequences of this discovery?***

As soon as it became clear that noise from anthropogenic sources could threaten the equilibrium of the ocean, the scientific community first turned its attention to the eighty-nine species that make up the order of cetaceans. Today, we have managed to determine the acoustic sensitivity of nearly twenty-five per cent of these species that use acoustic exchange on a daily basis, either for hunting or reproduction. The evolution of their brains is based on this perception – for more than 30 million years, in the case of some species.

Ten years ago, we discovered that marine invertebrates (cephalopods, crustaceans, shellfish, jellyfish, corals, etc.) have sensory organs to manage gravity in the sea – even though they have no auditory system. These species are sensitive to the perception of sound vibrations. Exposed to anthropogenic noise, they suffer acoustic trauma that threatens their survival. This is one of the most serious threats to the ocean's equilibrium.

● ***What is the impact of this noise on marine fauna?***

The primary effect is to interfere with communication signals. The sound information necessary for survival does not reach the species because of this noise pollution. For instance, noise can disorient cetaceans and prevent them from hearing a boat approaching.

© Shutterstock / Manamana

A whale displays its tail not far from a cruise ship, in Alaska, United States.

Noise can also be lethal. The sound source produced is sometimes so intense for an animal receptor that it causes immediate trauma that can be fatal for certain organisms. This is the case for sound sources associated with oil exploration or military underwater manoeuvres.

Finally, there is acoustic trauma. Long-term exposure to a sound source can cause fatigue of one of the species' receptor organs, leading to irreversible damage – such as the inability to pick up sounds.

● ***Did the drop in traffic caused by the global lockdown in spring 2020 lead to a decrease in noise pollution in the ocean?***

Our global underwater observatory network, Listening to the Deep Ocean Environment (LIDO), enabled us to carry out a comparative study of different noise levels in 2020. The lockdown did indeed lead to a reduction in the traffic of activities at sea, and thus there was a decrease in the intensity of the noise level. But this decrease was not significant. It was comparable to other periods of the year when traffic is usually less dense.

● ***How can we fight this noise pollution?***

For more than ten years, the technology has been available to operators to help their efforts to reduce acoustic impact. In modern transport ships, for example, the engine room is now insulated to prevent noise and vibrations from passing through the hull and into the water.

Some industries are taking initiatives to reduce the noise associated with their activities. Wind farm builders, for example, are working on membrane and bubble curtain systems to reduce the noise created by the installation of wind turbines.

Finally, it is now possible to act on the sound sources linked to oil exploration or military operations. Today's technologies make it possible to detect the presence of species that could suffer from the impact of noise and to wait until they move away from the areas of operation, in order to limit the risk.

This interview marks *The UNESCO Courier*'s collaboration with ChangeNOW. Its 2021 summit, to be held in Paris from 27 to 29 May, brings together decision-makers, entrepreneurs and innovators, to propose concrete solutions for a sustainable world.

Rebuilding marine life

Conservation measures to protect marine life are already paying off. These actions have made it possible to halt the decline of some species and re-establish degraded marine ecosystems. But restoring the health of the ocean on a large scale requires a more active fight against pollution, overfishing and the effects of climate change.

Carlos M. Duarte

Marine ecologist and Tarek Ahmed Juffali Research Chair in Red Sea Ecology at the King Abdullah University of Science and Technology (KAUST), Saudi Arabia.

Until very recently, the future of marine biodiversity did not give us much to be optimistic about. We had lost about half of the biomass of large marine animals and the extent of key ocean habitats – even more, in some cases. This was not just based on statistics, but sadly, also my personal experience. From the Arctic to Antarctica, from shallow coastal systems to the deep sea, I had witnessed many ecosystems – seagrass meadows, mangrove forests and coral reefs that were degraded and then lost.

However, around 2010, something started to change. Increasingly, studies documenting successes – the slowing down of losses, or even recoveries – were being reported from multiple parts of the world. Marine restoration projects were mushrooming around the ocean, and marine protected areas were growing in number and size. And I reported, along with others, on the recovery of various habitats such as mangroves, underwater meadows, and salt-marshes. Endangered species, like humpback whales and elephant seals, also registered an increase in their populations.

To determine whether this was the beginning of a trend reversal, I conducted a first assessment of what actions had enabled these successes in marine conservation – the oldest of which dates back to the 1970s. This assessment confirmed that the recovery of marine life was underway in a number of cases.

On the basis of that initial assessment, I brought together a team of leading marine ecologists to systematically assess the progress, to date, in recovering marine life, and the actions that had enabled these successes. We reviewed the status of key habitats, including seagrass meadows, mangrove forests, salt-marshes, coral reefs, kelp forests, deep-sea ecosystems and oyster reefs. We also studied marine megafauna, such as whales, sharks, sea-birds, and sea-turtles.

Trend reversal

Our assessment, published in the scientific journal, *Nature* in April 2020, showed that loss rates of sea-grass meadows, mangrove forests, salt-marshes had slowed down and, in many areas, these habitats were expanding. Likewise the populations of many large marine species were improving, with some of them displaying impressive comebacks. Forty-seven per cent of the 124 marine mammal populations assessed have seen a significant increase in recent decades, no change was detected in forty per cent, and only thirteen per cent have decreased. Some fishing areas had also improved in status – with a reduction of overfishing in the past two decades, and an increase in the proportion of fish stocks that are sustainably harvested.

These improvements in the components of marine life were rendered possible, in many cases, by policies and actions that were adopted in the 1970s. We realized that their benefits are just becoming apparent, because it takes about two to three decades for those policies to yield the expected outcomes.

In fact, a tide change of ocean recovery is conceivable if we take the necessary actions to catalyse the momentum created by the policies put in place decades ago.

We concluded that it is possible to achieve a substantial rebuilding of marine life, to between seventy per cent and ninety per cent of its past wealth by 2050.

This requires protecting species, as a large number of marine species continue to be endangered, some of them critically so. We also need to protect spaces. While in 2000, only 0.4 per cent of the ocean area was protected, this figure is approaching ten per cent in 2020, and is on course to reach thirty per cent by 2030. The protection needs to be active, driven by effective restoration action and the phasing out of destructive and damaging practices.

Fighting pollution and overfishing

We also need to remove all forms of pollution – from excess nutrient inputs to persistent organic pollutants and plastics. We have already achieved some wins in fighting pollution. The oceans are now restored from global lead pollution, thanks to the transition to unleaded petrol, which started several decades ago. This is a success that few are aware of, but one that must be celebrated.

We must harvest wisely, reducing catches to rebuild fish stocks, and fighting illegal and unreported fishing. This requires improved regulation and enforcement, and appropriate stewardship of fish stocks in the high seas. This is no longer dependent on self-reporting by fishing vessels, as improvements in satellite technology and artificial intelligence now allow monitoring activities at sea – not just illegal fishing, but also human and drug trafficking. Developing a sustainable aquaculture industry that closes the production cycle within the farm, will also help reduce pressure on wild stocks.

However, climate change is the backdrop against which our success plays out. Failure to mitigate climate change and to meet, or improve upon, the goals of the Paris Agreement will risk wasting many of the benefits of the actions being taken. Importantly, climate change poses the greatest risk for the recovery of coral reefs, which are already experiencing widespread mortality due to the extent of ocean warming – about 1 °C above the average temperature in pre-industrial times – already realized.

Increasing carbon storage

It is time for climate action to reach a new level of ambition. Rebuilding the abundance of marine life involves increasing the pool of living carbon in the ocean, therefore also contributing to mitigate climate change. The recovery of mangroves, salt-marshes and sea-grass meadows will be particularly effective, as these ecosystems rank highest in carbon sequestration mitigation across the biosphere. They are also our first line of defence from rising sea levels and increased storms because of climate change.

Solution-focused advances in scientific and technological research will be required to undertake the actions above in a cost-effective and reliable manner. The United Nations Decade of Ocean Science for Sustainable Development (2021-2030) provides a unique springboard to support our capacity to rebuild marine life.

This rebuilding will require significant investments, estimated at $10 billion to $20 billion per year. This may seem a steep amount, but it is a mere 0.02 per cent of global GDP. Yet, this investment is expected to generate significant returns – an estimated $10 for every dollar invested. The main beneficiaries will be insurance and seafood companies, and the tourism industry, along with the many communities that depend on the ocean for food and protection.

Rebuilt fisheries alone could increase the annual profits of the global seafood industry by $53 billion. Conserving coastal wetlands

© Manu San Felix

Many species of sharks are endangered, mainly due to human activities. It is not too late to introduce strict conservation measures to protect them.

> "The switch to unleaded petrol has rid the oceans of global lead pollution"

© Alejandra Oertega. KAUST

Mangroves fringing a forest in the Red Sea. These productive and diverse ecosystems are declining worldwide, except where reforestation projects have revitalized them.

could save the insurance industry $52 billion annually, by reducing storm flooding. Rebuilding marine life will also create millions of beneficial jobs, and will achieve UN Sustainable Development Goal (SDG) 14, Life Below Water.

Substantially rebuilding marine life by 2050 is an achievable, if challenging, goal. It requires a global partnership of diverse interests – including governments, businesses, resource users and civil society – aligned around an evidence-based action plan. This must be supported by a sound policy framework, a science and educational plan, quantitative targets, metrics for success, and a business plan.

The private sector must play an important role, particularly those businesses and corporations that benefit from a healthy ocean. Rebuilding also requires strong leadership to catalyse partnerships, align contributions and build synergies – while keeping up the momentum and overcoming roadblocks and setbacks.

Should we succeed, it would be a historic milestone in humanity's quest to achieve a globally sustainable future. Leaving devastated oceans to future generations is not an option. We have the moral obligation to succeed.

Green sea turtles return to the Seychelles

Fanny Douvere

Co-ordinator of the Marine Programme, World Heritage Centre, UNESCO.

The Aldabra Atoll in the Seychelles is unique because it houses some of the world's most ancient corals, from over 125,000 years old. It is also home to one of the largest populations of green turtles on earth.

When the atoll was inscribed on the UNESCO World Heritage List in 1982, its green turtle population was nearly extinct. By introducing strict protection measures for nesting beaches around the Aldabra Atoll, the number of these giant tortoises nesting annually, increased from 500-800 in the late 1960s to 3,100-5,225 in 2011.

Today, Aldabra Atoll's green turtle population is the largest in the Western Indian Ocean region, and is growing every year. The atoll's management is run as a professional enterprise, led by the Seychelles Island Foundation (SIF). Its UNESCO World Heritage status has helped to keep the area largely free from development, and to secure a regular flow of income through tourism.

Prior to the Covid-19 pandemic, sustainable tourism played a critical role in sustaining major scientific and monitoring programmes. Much of this support is now facing an uncertain future. This comes at a time when coral reefs are deteriorating rapidly due the effects of climate change.

Today, the marine sites inscribed on the UNESCO World Heritage List form a network of fifty protected areas across thirty-seven nations, stretching from the tropics to the poles. Recent research shows that green turtles from the Aldabra Atoll travel across the marine World Heritage sites network – some of them going as far as the Galápagos Islands in Ecuador.

The research highlights the ecosystem connectivity of ocean areas around the globe, and stresses the critical importance of international conservation mechanisms such as the 1972 World Heritage Convention to protect them.

Latin America
declares a war on plastic

Across the continent, a growing number of projects are encouraging a better understanding of marine environments, and helping to develop a form of "citizenship of the ocean".

Rodrigo Torres and Samila Ferreira

A maritime, coastal and underwater archaeologist, **Torres** is a professor at the Center for Coastal Heritage Research (CIPAC), of the University of the Republic, Uruguay.
Ferreira is a cultural anthropologist and researcher at CIPAC.

The project started in 2010 in Salvador de Bahia, on Brazil's north-eastern coast, the day after the Mardi Gras carnival. Observing the mountains of garbage thrown into the sea after the popular annual festival – during which millions of people take to the streets to dance and participate in the parade – four surfers decided to take action. They created O Fundo da Folia (the Festival Fund) to clean up the waste that had been dumped into the sea.

A decade later, the association still exists, and has even grown through the years. Scientists and local residents now participate in the operation, not hesitating to dive to the bottom of the sea to clean up the rubbish. They have no oxygen cylinders and are helped only by volunteers perched on paddle boards.

More than 200 activities have already been launched as part of this initiative, which combines sport with environmental awareness, and has cleaned out hundreds of tons of waste from the sea floor. In 2019, the area covered by the project was declared a protected zone at the municipal level. As a result, the Barra Marine Park, Brazil's first marine reserve in an urban context, was established.

This local initiative is just one example of the growing awareness in Latin America of the need to combat marine pollution – that includes beach clean-up projects, awareness-raising workshops in schools, "zero waste" campaigns on social networks, etc.

"For a Strawless Ocean", a campaign by the Government of Chile to free the oceans of plastic.

> "In Brazil, the Fundo da Folia has collected hundreds of tons of waste from the sea floor"

Plastic islands

The images circulated by the media and on social networks – of beaches that have turned into garbage dumps and of turtles drowning after ingesting plastic bags – have had a great impact on the general public. The seas around us are overflowing with garbage: an estimated eight million tons of plastic are dumped into the world's oceans every year. According to the World Wildlife Fund (WWF), Latin America is the fourth-largest producer of plastic waste in the world.

However, a significant part of this waste washes up on beaches, drifts on the surface of the oceans, or invades the sea bed by decomposing into micro-particles. Today we know that about a thousand kilometres from the Chilean coast, there is an alarming concentration of plastics in the ocean – up to 50,000 pieces of debris per square kilometre in some areas.

Plastic straws, for example, which can take a hundred years to decompose, are typical of the single-use objects that have invaded our daily lives. Several Latin American countries – including Argentina, Brazil, Chile and Mexico – have joined global initiatives to ban the use of plastic straws, and have launched campaigns on social networks to raise awareness of their toxicity.

These campaigns may seem trivial, considering the scale of the problem. Yet, though straws represent only a tiny part of the total volume of marine waste, these campaigns contribute to a much wider public awareness of the negative effects of the disposal of seemingly harmless plastic utensils, which are ubiquitous. They also

Ocean literacy for all

Although oceans cover seventy-one per cent of the planet, play a decisive role in regulating the climate, and provide humankind with indispensable resources, they do not feature prominently in school curricula and textbooks. It is from this observation that the concept of *ocean literacy* – access to knowledge about the ocean – was born.

In the early 2000s, a group of American ocean scientists and teachers campaigned for the inclusion of ocean science in school curricula. The movement then spread around the world. It has also expanded. The idea is not only to improve the knowledge of students, but also to foster a civic awareness of the crucial role that oceans plays in the balance of the planet.

From the beginning, the Intergovernmental Oceanographic Commission (IOC) of UNESCO has played a major role in this movement. In 2012, the IOC organized the first conference on this topic in Europe. Five years later, it was at the forefront of a coalition of institutions and organizations to promote "Ocean Literacy for All" at the United Nations Ocean Conference in New York in June 2017.

In December the same year, the Commission organized an international Ocean Literacy conference in Venice, Italy. It also launched a handbook, *Ocean Literacy for All: A toolkit,* which provides resources for schools and institutions. More recently, the IOC launched an international portal providing educational resources for the public.

encourage us to think about our consumer habits and the impact of our daily actions on the environment.

The sea in 3D

In addition to these initiatives, raising public awareness also involves the dissemination of educational and teaching resources. This enables young people not only to better understand the complex physical, chemical and climatic phenomena that govern the ocean, but also to help change our perception of, and our relationship with it.

In an increasingly hyperconnected world, digital technologies offer interesting possibilities in this respect. In Uruguay, for example, a project called Route of the Vessels: Developing a Virtual Museum of the Maritime Landscape of Maldonado Bay provides information on issues related to the preservation of maritime and underwater Uruguayan cultural heritage. It proposes educational and recreational experiences, using innovative technologies to familiarize people with scientific research.

> "Eight million tons of plastic are dumped into the world's oceans every year"

The programme includes the three-dimensional modelling of iconic sites linked to the region's maritime history, using virtual and augmented reality to create exhibitions on seafaring people, their boats, historical routes and maritime landscapes.

The goal is to take advantage of the possibilities provided by digital culture to encourage the public to take ownership of their cultural heritage – and to explore the changes in perspective that have shaped people's relationship to the sea, the construction of identities, and the sense of belonging.

Beyond their differences in approach, these initiatives have a common thread: they make us think not about what the oceans can do for us, but about what we can do for the oceans.

© Gabriel Mussi

Volunteers participating in the Fundo da Folia project dive to collect the garbage thrown into the sea during Brazil's Carnival.

China: A mobile laboratory to explore the ocean floor

China's RV *Zhong Shan Da Xue*, is a gigantic state-of-the-art floating laboratory that will help scientists discover the deep seas. One of its first missions is to study a whale fall that was recently discovered.

Yu Weidong

Professor at the School of Atmospheric Sciences, Sun Yat-sen University in Guangzhou, China, with an expertise in ocean-atmosphere interaction, the monsoon, and climate variability.

On 18 March 2020, marine scientists on an expedition aboard the research vessel RV *Tansuo-1* made an extraordinary discovery. The team, which included co-chief scientist Wei Xie, associate professor at the School of Marine Sciences at Sun Yat-sen University (SYSU), witnessed a whale fall in the South China Sea (SCS), 1,600 metres below the sea surface.

A whale fall occurs when whales die, and their carcasses sink to the ocean floor, creating complex localized deep-sea ecosystems. This sudden concentrated food source acts as an oasis for life in the deep sea, providing sustenance to deep-sea organisms for years, or even decades.

There are less than fifty modern natural whale falls in the world, and this is the first of its kind in this zone, according to Wei. The whale carcass of approximately 3.4 metres in length still had fish tearing at its tail, indicating that it died only recently, and so has "long-term observation value", the scientist explained.

This discovery is of great significance because it will help promote the research of how marine ecosystems support life in the pitch-dark depths of the ocean, which remains largely unexplored around the globe. Understanding the changing process of the whale fall and neighbouring ecosystems could aid conservation efforts and the harnessing of deep-sea biodiversity resources. Exploring the ocean floor can also teach us about how best to handle climate change.

Remotely operated vehicles

The challenge of the long-term monitoring of the whale fall will be one of the missions of the RV *Zhong Shan Da Xue*. Launched by SYSU on 28 August 2020, and named after its developer, the research vessel is part of the infrastructure investment of the university's ambitious programme to promote its ocean science cluster since 2015.

The largest oceanographic research vessel in China, and second only to the Japan Agency for Marine-Earth Science and Technology's (JAMSTEC) RV *Mirai*, the vessel is 114.3 metres long and 19.4 metres wide, with a total tonnage of 6,800 tons. With a long-distance cruising capacity of 15,000 miles, the vessel can host a hundred people – a crew of twenty-four and seventy-six scientific team members – it is equipped to embark on sixty-day expeditions.

Featuring a stationary laboratory and a large deck space, the vessel's quarterdeck can carry an additional ten mobile container laboratories. The advanced research equipment allows scientists to process, test and analyse samples aboard the RV. It also facilitates the full-depth profiling of water parameters, and bottom geological and geophysical sampling of the sea bed.

The vessel is equipped with remotely operated vehicles (ROVs), unoccupied and highly manoeuvrable machines that are remotely operated from the ship. ROVs can stay underwater much longer than divers or any type of submersible occupied by humans, which facilitates detailed experiments and collecting samples from the ocean floor.

The research ship is the first in China to feature an advanced weather radar, a

A whale fall spotted during a manned submersible dive from RV Tansuo-1 *in the South China Sea, March 2020.*

© Courtesy of Dr. Mengyuan Wang, Sun Yat-sen University

> "Exploring the ocean floor can teach us how best to handle climate change"

powerful tool to study the strong convection and intensive rainfall over the ocean, which is critical to understanding and predicting extreme weather over land. The RV also boasts a landing deck for helicopters and drones, which enhances its logistics support.

Probing the abyss

Once in operation in 2021, the vessel's research will complement satellite observation, which is strong in wide spatial coverage, but weak in vertical penetration, when it comes to plumbing ocean depths.

The SCS hosts its own regional monsoon system, which is one of the most complex and least understood climate systems in the world. It also plays a role in the water exchange between the Pacific, through the Luzon Strait, and the Indian Ocean through the Indonesian Through-Flow (ITF), an ocean current which influences the global climate. All these environments contribute to the SCS becoming a hot spot, featuring some of the richest biological and ecological diversity in the world.

So far, ocean-related research around the SCS has been mostly confined to the coasts due to the lack of resources for scientific ships. This has prevented the SCS Rim countries from developing their capacities to sustainably manage the ocean. The newly-commissioned RV will provide new opportunities for multidisciplinary research and the deep-sea exploration of the largely unknown SCS.

> "A significant part of ship time will be dedicated to research and training"

A crucial function of the RV is its research and training, with a significant part of its ship time allocated to on-board and in-cruise training. This forms an integral part of SYSU's university programmes at various levels.

A floating classroom

In the past five years, the university's undergraduate and postgraduate students have participated in six in-cruise training courses. This included a one-month cruise aboard RV *Shen Kuo,* a vessel contracted by SYSU in 2019. Students studied the air-sea interaction during the monsoon over the northern SCS continental shelf. This was done by conducting atmospheric boundary layer observation using GPS sounding and drones.

The training programmes are expected to receive a boost when the new classroom at sea becomes operational. They will also be open to students from the SCS Rim countries.

Over the next decade, the university plans to offer cruises on the new RV which will focus on the SCS Monsoon Experiment, Deep Ocean Life and Ecosystem Study. The challenge of a lack of data on the SCS is expected to be resolved in the coming years.

This mobile laboratory will help the surrounding countries to supplement and extend their nearshore and coastal studies to more offshore deep-ocean areas, for a more complete understanding of the ocean. Regional efforts to address climate change, such as ocean heatwaves, acidification, deoxygenation, extreme weather and climate disasters will be supported by this vessel.

Much of its ship time will be dedicated to regional co-operation, particularly under the umbrella of the United Nations Decade of Ocean Science for Sustainable Development (2021-2030). Its goal is to inspire young people, who could be oceanographers in the future.

The launching of RV Zhong Shan Da Xue, *Sun Yat-sen University's comprehensive research and training vessel, August 2020.*

© Courtesy of Lijian Wu, Sun Yat-sen University

In Tahiti, a lagoon rescued by tradition

On Tahiti's southern tip, the traditional practice of *rahui* – which temporarily prohibits fishing and the harvesting of resources from the sea – was recently reintroduced. This has allowed marine life in the surrounding ocean to regenerate and thrive again.

Esther Cunéo

Journalist based in Papeete

> "Today, *rahui* is supported by ninety per cent of the inhabitants of French Polynesia"

Far from the bustle of Papeete, the jungle of Tahiti Iti, or the Taiarapu Peninsula, appears even more luxuriant in the rain. Located on the island's south, this "Land beloved of the gods" – or *Fenua here hia te atua,* as the elders still refer to it in Tahitian – is undisturbed by roads.

Better known as Fenua Aihere (land in the bush), it is the last remaining wilderness on the main island of French Polynesia. Two villages share these verdant lands – Teahupoo on the south-western coast and Tautira on the south-east.

The virgin forests that cover the area still conceal several *marae,* the sacred ceremonial and social spaces where ancient Polynesian rites were once performed. This is why the 600 inhabitants of Fenua Aihere say their land is infused with *mana,* the supernatural power that emanates from nature.

"The *mana* exists because this area has been preserved, it's really a magical place. Out of respect for those in the beyond, we should not build a road here," insists Annick Paofai, president of the association to protect Fenua Aihere. In fact, the few city dwellers who have tried to defend the construction of a path to their second homes have been turned down by the court. "If you want to live in Fenua Aihere, the only way to get there is on foot, by pirogue [a canoe] or by boat," Paofai insists.

But here, as elsewhere, the health of the lagoon began to decline in the 1990s. The loss of biodiversity was reflected in a reduction in fish stocks; the proliferation of invasive species like the Acanthaster planci, a coral-eating starfish; and the depletion of certain key species like the surgeonfish.

Attracted by a resource that was reputed for its abundance, fishermen from outside the area started fishing here, leading to clashes with the Teahupoo locals. These conflicts have led to calls for better regulation of the use of the lagoon, since the end of the 1990s. "Local fishermen were afraid [to lose their livelihoods], and asked me to set up an association to revive *rahui,*" Paofai explains.

Mixing politics and the spirit world

A traditional practice that has not been used for decades, *rahui* consists of temporarily restricting or banning access to the harvesting of essential resources in the forest, land or sea to allow the area to naturally regenerate itself. Imposed by a clan or chieftaincy, this prohibition was originally both a political and a sacred matter. The *tapu,* or temporary taboo, was invoked through a sacred chant by an *ari'i* (king) or a *tahu'a*, a medium acting as a link between the spirit world and the living. "In the eighteenth century, when the warrior Vehiatua introduced *rahui* to Teahupoo, anyone who did not respect it was condemned to death," says Gérard Parker, a former mayor of Teahupoo.

"This intervention by the spirit world lasts as long as it takes for nature, the animal, the tree, or the fish, to regenerate itself," explains Yves Doudoute, founding member of the Haururu association, and a strong advocate for the region's cultural heritage. The key to its effectiveness is *mana,* which is at the heart of their culture. "Before they came into contact with the West, Polynesians did not live in nature, but in relation to entities charged with sacredness," writes Bernard Rigo, cultural anthropologist and former head of the Human Sciences Research Laboratory of French Polynesia.

While fishermen were opposed to the setting up of a marine protected area by the authorities, they were more open to the introduction of *rahui*. "The sacred nature of *rahui* sets it apart from an administrative ban, making its dissuasive powers more effective," Doudoute states. "A purely human and random form of authority has limited power of persuasion," confirms Rigo. In contrast, with *rahui*, it is believed that the punishment is "inevitable, because its transgression breaks the sacred circuit, and all the energy is diverted against the transgressor."

The fish return

In French Polynesia, the inhabitants of Rapa in the Austral Islands, and Maiao in the

The start of the rahui *zone in Teahupoo.*

Society Islands, were the first to reinstate *rahui* in the early 2000s on parts of their islands.

It was not until 2014 that a *rahui* was created in the lagoon of Taiarapu-Est. Covering a marine surface area of 750 hectares, the lagoon is managed by a committee made up of elected officials, fishermen's representatives, delegates from local associations, scientists, and officials from the environment department. "This custom has not existed here for a long time. That is why it has taken a while to return to this practice," explains Paofai.

Thanks to the efforts of the inhabitants, the *rahui* has been legally protected under French Polynesia's environmental code since 2016. Article LP 2122-1 stipulates that: "The *rahui* is a land and/or marine area over which unwritten rules dictated by a resource management imperative are applied in a traditional manner."

Today, the *rahui* covers five per cent of the lagoon. Six years later, the result is clear: the fish have returned. But for now, there is no question of lifting the ban. Fearing a new decline in marine species, the management committee is even thinking of making it permanent.

"The fish have come back, but if we lift the *rahui*, it won't be long before the stocks are depleted again," warns Paofai. The threat of outsiders coveting the lagoon's abundance has not waned. Although only one guard has been assigned to watch over the site, the local residents remain vigilant. "At night we sometimes see *mori pata* (flashlights). In that case, we intervene," the president of the association says.

The battle to save the coast

Some inhabitants of Fenua Aihere would like to extend the marine protection that applies to the maritime zone to the coast – to establish continuity between the land and the sea. "You cannot protect the marine areas without including the coastline, but convincing the local residents will not be easy," admits Paofai. The area that hosts the Te Pari hiking trail, with its spectacular views of basalt cliffs plunging into the ocean, is very popular with tourists – it would be hard to keep visitors away. And while this little corner of paradise is still largely protected from human activity, the lagoon waters surrounding Papeete, the capital, are regularly clogged during the rainy season because of the furrows dug to accommodate the increased urbanization of the mountainside.

Anchored in tradition, *rahui* has, over the years, become established as a sustainable means of managing marine resources. According to a 2019 study by Alvea Consulting, a management consulting firm based in Papeete, *rahui* is supported by ninety per cent of the inhabitants of French Polynesia today. "That's reassuring. It proves that it is still possible to live like our ancestors, thanks to this system," Doudoute says. He is calling for a *rahui* zone in the Papenoo valley, in the north of Tahiti, which is known for its spectacular waterfalls. "We must return to the sacred, to the common good. We have no choice. When you live on a pirogue, you must become one with the world."

Africa:

The rush for blue gold

Viewed as a strategic sector by a growing number of African countries, the blue economy, which involves the sustainable use of ocean resources, could become an important lever for development in the years to come. But this will only work if efforts to combat the impacts of climate change and overfishing are intensified.

Adam Abdou Hassan

Professor and researcher in public law at the University of Rouen Normandie, France, and Executive Director of the Niger Institute of Strategic and International Studies.

The African Union has hailed the blue economy as a "new frontier of the African renaissance". In its Agenda 2063, which sets the strategic directions for future decades, the pan-African organization identifies the blue/ocean economy as one of its goals and priority areas. The publication of a policy handbook in March 2016 on the continent's blue economy by the United Nations Economic Commission for Africa is another indicator of the interest in this sector.

Although it is still a relatively new concept, the blue economy could be a powerful tool for the development of the African continent. Some countries, such as the Seychelles, have already taken steps towards it, by integrating the harnessing of the ocean into their development plans. In 2014, South Africa launched Operation Phakisa ("hurry up" in Sesotho), to sustainably exploit the economic potential of the ocean through maritime transport and manufacturing, offshore oil and gas exploration, and aquaculture. In West Africa, countries including Togo and Senegal have adopted strategies to build a sustainable blue economy.

The prospects are promising for a continent which includes thirty-eight coastal and island countries, with territorial waters covering 13 million square kilometres, out of a total of fifty-four states. In addition, over ninety per cent of African imports and exports are carried out by sea.

A vital source of protein

Marine resources could help address the nutritional and food security issues of nearly 200 million Africans, through the vital contribution of marine and freshwater fish. In food-deficient and low-income countries, fish provides almost twenty per cent of animal proteins consumed by their populations. This number rises to fifty per cent in densely-populated island and coastal countries such as Ghana, Guinea, and Senegal. The stakes are therefore high, especially because Africa's population is set to double by 2050 – from 1.2 billion to 2.5 billion inhabitants.

The aquaculture and fisheries sector – which employs about 12.3 million people in Africa – is still largely under-exploited.The industry needs to be professionalized further to create more jobs. The development of related jobs – such as the processing, treatment and transformation of fish by setting up specific modules, and the local or sub-regional manufacture and weaving of nets, etc. – also needs to be encouraged. The development of these jobs could enable the social integration of vulnerable populations, such as youth and women. In West Africa, these groups are already responsible for selling nearly eighty per cent of all seafood products. However, the tasks they perform are under-paid and their contributions to the economy, to employment, and to food security are underestimated.

The blue economy could provide the opportunity for African states to take a leap forward in the industrialization process. This could be done by skipping some steps, while integrating climate change and sustainability measures. Biotechnology, in particular, makes it possible to manufacture products in the biological, pharmaceutical and food sectors, and offers an alternative to the use of traditional fossil fuels. Morocco, for example, has seized the economic opportunity to exploit marine algae. Its BIOXPARC network of technology parks is a biotechnology hub in Marrakesh. The trans-border laboratory BIOVecQ in Tunisia is yet another example of the sustainable processing of aquatic products.

> "Marine resources could help to address the food security issues of nearly 200 million Africans"

A fisherman transports his catch of sailfish on his head and shoulders to a fish market in Mogadishu, the capital of Somalia.

Spirulina and fish biscuits

Innovation and research, especially in new sectors related to the added value of services from the sea, can stimulate sustainable blue growth. These initiatives are already multiplying across the continent. The Songhaï Centre in Porto-Novo, Benin, has developed a blue economy model that combines energy and plant production with aquaculture. It produces methane from wastewater to provide energy for domestic use. Following a mineralization process, the compost remains can be used to feed phytoplankton, zooplankton, and benthos – which in turn are used to feed fish in a fish farm.

Another example that showcases innovation is the Institute of Fisheries and Aquatic Science, Yabassi, at the University of Douala in Cameroon. It has set up a pilot unit for the production and processing of spirulina, used for the manufacture of soaps, yoghurts, and drinks. In Kenya, AquaEdge Africa is working to transform fish into high-protein biscuits.

However, to fully exploit the potential of the blue economy, countries need to address the adverse impacts of climate change and environmental mismanagement. Africa is vulnerable to the negative effects of human-induced climate change. This is not the only challenge, though. The over-exploitation of some fishing grounds is of major concern.

One of the world's richest fishing regions, West Africa is also one of the most affected by overfishing. According to a 2016 review on the Fish Trade by the United Nations Conference on Trade and Development (UNCTAD), half of the fish stocks off West Africa's coast are considered overfished. This is partly due to illegal fishing.

The Overseas Development Institute (ODI), an independent global think-tank, estimates that over fifty per cent of the fish resources of the coastal zone from Senegal to Nigeria have already been over-exploited. It is estimated that illegal fishing accounts for between a third and a half of the total regional catches.

Overcoming these obstacles will require a concerted effort by countries in the region. Adopted in 2016, the African Union's Lomé Charter is a response to the "illegal exploitation and plundering of marine resources." It prohibits trade in products derived from such exploitation, which also jeopardizes the food security of the continent. It is therefore essential that African States develop responses to these challenges, so that their populations can fully benefit from this bounty from the oceans.

Public domain: AU-UN IST PHOTO/STUART PRICE

The making of an intergovernmental ocean commission

In the aftermath of the Second World War, some countries advocated the sharing of oceanographic knowledge on a global scale. However, it was not until December 1960 that the Intergovernmental Oceanographic Commission of UNESCO – the first body responsible for strengthening intergovernmental co-operation in the marine sciences – was created.

Jens Boel

A Danish historian and UNESCO's Chief Archivist from 1995 to 2017, he initiated the UNESCO History Project in 2004, to encourage the use of its archives. Boel's next book, *Exploring the Ocean*, on the history of the IOC, will be published in 2022.

Between 1959 and 1965, forty-five research vessels sailing under fourteen different flags explored the Indian Ocean. Atlases, maps and scientific studies resulting from this expedition revolutionized geological, geophysical and marine-biological knowledge of this ocean. The monsoon and its variations were better understood, and food resources and mineral deposits discovered. The expedition also enabled countries like India, Indonesia, Pakistan and Thailand to build or expand their marine science infrastructures. The International Indian Ocean Expedition (IIOE) was unique, and at the time, was the biggest ocean exploration ever launched.

Co-ordinating this unprecedented international research effort was the first major activity of the Intergovernmental Oceanographic Commission (IOC), which celebrated its sixtieth anniversary on 14 December 2020.

Knowledge sharing

The journey towards the creation of the IOC had been a long one. Already, at the first session of the General Conference in November 1946, India had proposed the creation of an institute of oceanography and fisheries to study the Indian Ocean. However, the first political initiative to make UNESCO include marine science activities in its programme came from Japan. In 1952, the country presented a draft resolution with the purpose of engaging UNESCO to promote international co-operation on oceanography. This was done with the view to optimize the use of marine resources – fisheries, minerals and energy – and thereby "provide a basis for the peaceful coexistence of all mankind".

The proposal was well-received, but did not lead to any significant commitment of UNESCO's resources. The breakthrough came at the next session of the General Conference, in 1954, when Japan again proposed that UNESCO should launch a marine sciences programme.

The International Geophysical Year (IGY), from July 1957 to December 1958, was an essential part of the dynamics

When science goes to sea

The Vendée Globe, the largest sailing race around the world – solo, non-stop and without assistance – took off on 8 November 2020 from Les Sables d'Olonne, France. From the start of the race, ten skippers carried scientific observation instruments onboard. A total of seven meteorological buoys and three profiling floats from the Argo France programme were deployed in under-sampled areas of the ocean, not often visited by research vessels.

This collaboration is the result of a partnership signed in January 2020 between UNESCO and the International Monohull Open Class Association (IMOCA) to support ocean sciences and protect the oceans. Co-ordinated by the Global Ocean Observing System (GOOS), it is supported by UNESCO's Intergovernmental Oceanographic Commission (IOC).

About 2,000 profiling floats and drifting buoys need to be deployed every year to sustain GOOS. These ocean-observing instruments are usually deployed through research ships, but racing yachts provide a cheaper alternative and can reach more remote areas.

Collected through an *in situ* network and satellite ocean observations, the key oceanographic and meteorological data is used in climate studies, weather forecasting and the monitoring of marine ecosystems. Implemented by 86 countries, the global observing system is a joint effort of the IOC, the World Meteorological Organization (WMO) and the Observations Programme Support (OceanOPS) Centre.

Currently, 10,000 *in situ* observing instruments – including networks of autonomous profiling floats, drifting and fixed buoys, piloted underwater robots, ships, sea level tide gauges, and even marine mammals – monitor the global ocean and measure its main physical and biogeochemical parameters.

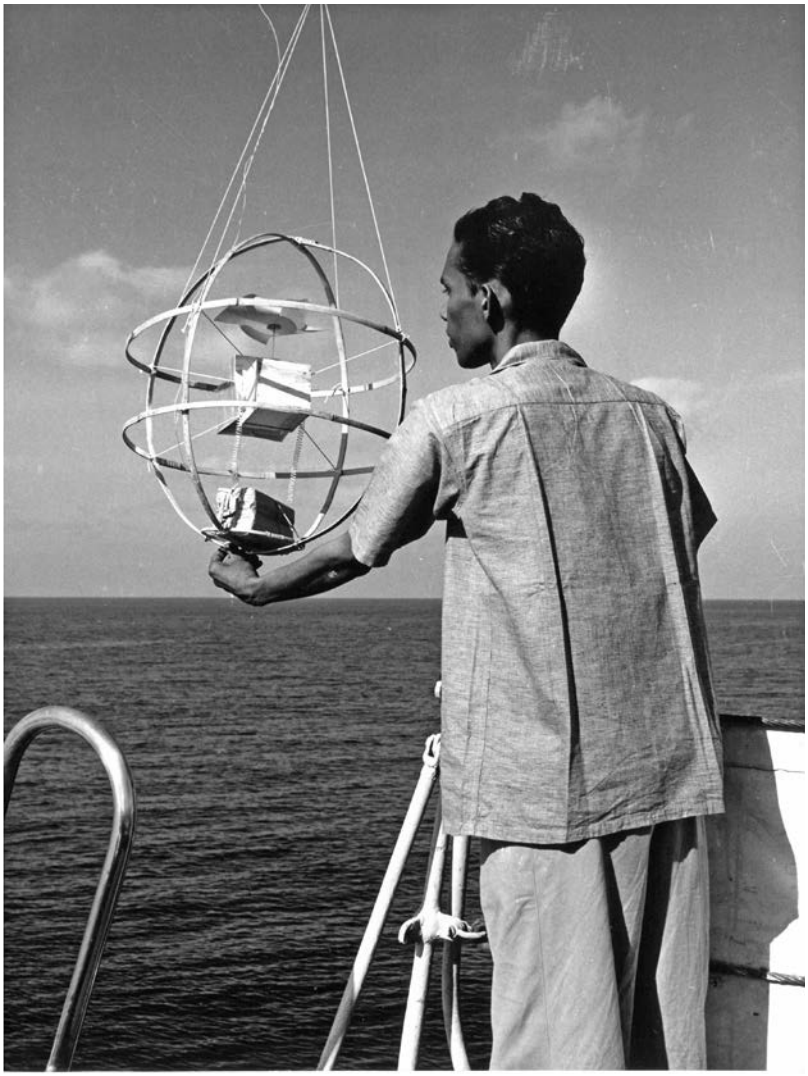
that eventually led to the creation of the IOC. During this time, the IGY formed the framework for a vast range of global geophysical activities.

The best known of these is the Soviet launch of Sputnik I, the first artificial satellite, but the IGY also greatly enhanced the interest of the international community in oceanographic projects.

This interest was driven by a variety of motivations – in particular an interest in waves, currents and tides; concerns about radioactive pollution; the search for food and other resources in the ocean; the wish to explore the deep sea bed, and to understand the interactions between the ocean and the atmosphere. The idea that it was necessary to collect and share data on a global scale on all these subjects was gradually gaining ground.

In July 1960, UNESCO convened an oceanographic conference in Copenhagen, Denmark. Delegations from thirty-five countries gathered with representatives of other United Nations agencies and international organizations. They recommended that UNESCO establish a new intergovernmental body to promote the scientific investigation of the ocean.

The proposal was accepted in December 1960 by the General Conference. It was unprecedented. Never before had ocean sciences been so high up on the international political agenda.



© UNESCO / Ministry of Information, Government of India

A meteorological observation balloon equipped with a transmitter being released in 1963, as part of the International Indian Ocean Expedition (1959-1965), co-ordinated by the Intergovernmental Oceanographic Commission.

From idea to action

In the beginning, the IOC's place in UNESCO was far from obvious. Some of the scientists who took the initiative to create the Commission would have preferred the establishment of a separate United Nations agency, the World Oceanographic Organization (WOO). Other UN agencies questioned why UNESCO should take the lead in this particular field. For instance, both the Food and Agriculture Organization (FAO) and the World Meteorological Organization (WMO) put forward their expertise in fisheries and meteorology respectively.

Issues about 'who should do what' have remained a challenge over the years, but most IOC activities have been carried out in close co-operation with UN agencies and other stakeholders. The IOC also has a recognized role in the UN Convention on the Law of the Sea (UNCLOS), the global legal framework for the ocean.

Another challenge was the scope of the mandate of the new Commission. One of the debates at the beginning was whether it should mainly support the most advanced research to push the boundaries of human knowledge of the ocean as quickly as possible, or concentrate on building the oceanographic capacities of developing countries. In reality, the IOC has been doing both, with a greater emphasis on capacity development today.

During the sixty years of its existence, the IOC, which now has 150 Member States, has gradually reoriented its emphasis towards systematic, sustained observation systems – such as the Global Ocean Observing System (GOOS), created in 1991 – and the overarching concept of sustainable development. At the same time, research and knowledge sharing on all ocean science-related topics, such as *The Global Ocean Science Report*, remain the leitmotif of its work.

An early accomplishment was the establishment, in 1961 of the International Oceanographic Data and Information Exchange (IODE), which remains a cornerstone programme of the IOC. Among its projects since 2009, is the Ocean Biodiversity Information System (OBIS).

Another highlight of the IOC's activities is the Pacific Tsunami Warning and Mitigation System (PTWS). Created in 1965 to save lives, it has since served as a model for other exposed regions – including the Indian Ocean, the Caribbean, the North-East Atlantic and the Mediterranean.

The IOC ensured the leadership of the International Decade of Ocean Exploration (1971-1980), to raise awareness of the importance of ocean science. So it was only natural that fifty years later, the Commission took the lead when the UN proclaimed a Decade of Ocean Science for Sustainable Development from 2021 to 2030.

ZOOM

This photo-reportage marks the World Day for African and Afrodescendant Culture, celebrated on 24 January.

New Orleans:

Black neighbourhoods pay homage to Native Americans

Photos: Lynsey Weatherspoon
Text: Katerina Markelova, UNESCO

The tradition of the Mardi Gras Indians is one of the least known in the southern United States. Every year in February or early March, over forty "tribes" with names such as Wild Magnolias, Golden Eagles and Washitaw Nation join the New Orleans Carnival* to compete in symbolic jousting, outdoing each other with their ritual songs and dances. The exuberance of their outfits is inspired by the ceremonial clothing of the indigenous people of the Plains. This is one way for the city's African-American communities to pay homage to the Native Americans who took in runaway slaves in the bayous of Louisiana.

Excluded from participating in Mardi Gras festivities – a tradition imported to Louisiana by the French at the end of the seventeenth century – the black neighbourhoods of New Orleans established their own celebrations. The first tribes of Black Indians were formed towards the end of the nineteenth century. For a freed black slave, becoming an "Indian" was a way of asserting dignity and respect for Indian resistance to white domination.

Decorated with hundreds of thousands of pearls, sequins and rhinestones, the ornaments, with brightly-coloured ostrich feather headdresses, can weigh as much as seventy kilos. Entirely handmade, they could take a whole year to create. Each tribe has positions among its members. The Big Chief's house serves as both headquarters and a sewing workshop, where the long beading sessions are conducive to oral transmission. The members of the tribes move up the ladder of an elaborate social organization. The Big Queen now holds an increasingly important place.

Music plays a central role in the Mardi Gras Indian parades. Progressing to the rhythm of percussion, the tribes typically use call-and-response chanting – a binary form consisting of a dialogue between a soloist and a group. Sung on the plantations, this musical form from Africa is one of the sources of jazz.

Over time, this tradition has spread to other occasions throughout the year, such as St. Joseph's Day, Super Sunday, and the New Orleans Jazz & Heritage Festival. The photos in this series were taken in 2017, during Super Sunday, which takes place on the Sunday closest to St. Joseph's Day, celebrated every year on 19 March.

* The New Orleans Mardi Gras 2021, which attracts more than a million people each year, has been cancelled due to the pandemic.

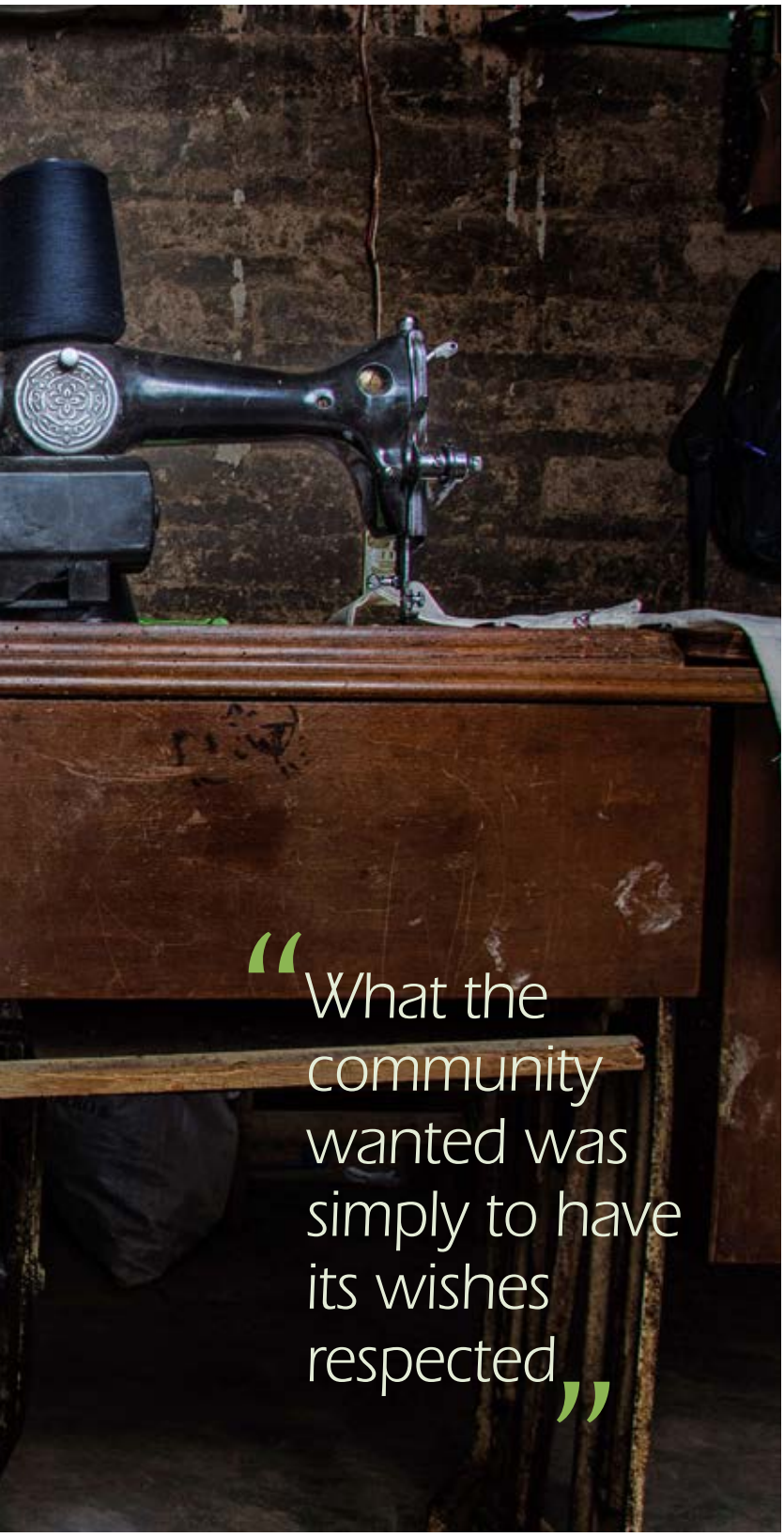
15
15

BIG
CHIEF

IDEAS

María Pérez, a seamstress in Tlahuitoltepec, Mexico, uses traditional Mixe patterns to create the colourful blouses and full skirts worn by the women of her community.

Who profits from ethnic labels?



© Eric Mindling (ericmindling.com)

Ethnic motifs are very much in style. Revived by designers and major brands, they adorn fashion items sold all over the world – often without the permission of the communities from which they originate. The author, a Mexican anthropologist who specializes in traditional textiles, advocates taking better account of the rights and interests of indigenous communities.

Marta Turok

Curator of the Ruth D. Lechuga collection of folk art at the Franz Mayer Museum in Mexico City, she is the author of numerous books and articles on arts and crafts.

The story goes back to 2015. Susana Harp, a famous singer who is also a senator in the Mexican Congress, was surprised to find an embroidered long-sleeved blouse – very similar to those made by the Mixe indigenous community of Santa María Tlahuitoltepec, in her home state of Oaxaca – in a boutique in a Las Vegas shopping mall.

The garment, which carried the label of a French designer, had been made in India using the same pattern, embroidery technique, colours and design as the original. The only difference was that the blouse was being sold in the United States for $290, compared to about $35 in Tlahuitoltepec.

Outraged, Harp shared an image of the two designs of the blouse on social media, along with its label that made no mention of its origin. She also filed a lawsuit, claiming plagiarism and cultural appropriation.

In the months that followed, community leaders made several public declarations in Oaxaca and Mexico City, accompanied by representatives of the embroiderers. They pointed out that the designer had not contacted them – denying them the opportunity to explain the significance of the blouse's motifs. Their 600-year old traditional garment design was not for sale, they declared. The real issue, they insisted, had nothing to do with granting permission, or the payment of reproduction rights or royalties.

Sacred landscape

In a further surprising twist to the story, another French fashion company was also suing the same designer in the French courts for plagiarism, claiming its earlier use →

of the identical Mixe motifs. In order to win her case, the designer claimed that she had visited the community and had directly purchased the blouse from them.

Producing evidence to show that this trip had taken place prior to the time specified by the plaintiff, the designer concluded that she had "borrowed" the design of the blouse and its embroidery from the Santa María Tlahuitoltepec community – thereby acknowledging she was not the design's owner. Meanwhile, at the request of the Mexican Senate, the Mexican Institute of Industrial Property (IMPI) declared there had been no plagiarism because the "work" had not been registered.

Finally, it should be noted that the text on the garment's label indicated that the blouse had been "made of unbleached cotton muslin and delicately embroidered intricately with black and burgundy thread to form a beautiful floral design".

However, the motifs reproduced on the original Tlahuitoltepec blouse – called *xaamnïxuy* in the Mixe language – represent a sacred landscape: the sun, the agave cacti, the earth, the path, the mountain, the offering, the water and the flower. In this community, wearing the *xaamnïxuy* every day is a matter of identity and protection.

What the community wanted, in this case, was simply to have its wishes respected, and that its heritage be recognized. It refused to allow the blouse to be taken out of its cultural context and be transformed into a mere commodity on the world's fast fashion market. As long as the production and economic benefits remained under its control and respected its criteria, it saw no obstacle to artisans producing and selling the blouse and other garments within and outside the community.

Interestingly, sales of *xaamnïxuy* increased, following the media campaign. At the first Latin American meeting for the defence of cultural heritage, ancestral knowledge, collective intellectual property and indigenous peoples' territories in San Cristóbal de Las Casas, in Chiapas in September 2018, weavers and embroiderers similarly concluded that "Our know-how is not to be privatized or patented; our designs and our cultural heritage are part of the life of our territories".

© Eric Mindling (ericmindling.com)

Erlinda Mateos weaves a length of cloth on a traditional backstrap loom, on her porch in San Juan Cotzocon. Like nearly all Mixe women, she has been weaving since she was quite young, to create clothes for herself and for sale.

Plagiarism lawsuits

The case of the embroidered blouse of the Santa Maria Tlahuitoltepec community is emblematic of the debates on intellectual property. Today, indigenous peoples and communities and their artisans are increasingly challenging what they consider to be the misuse of their cultural elements by outsiders – without prior consultation or authorization. As a logical consequence, lawsuits for cultural appropriation, plagiarism or theft, are proliferating.

Globalization, new technologies and geographical mobility are accelerating the dissemination of information, giving cultural diversity a worldwide visibility that it has not had before. The repercussions are twofold and paradoxical. In the absence of mechanisms for the protection of collective cultural rights, actors from outside the producing community have easy access to the motifs and forms they use – often displaying an attitude that could be described as neo-colonialist. On the other hand, these same factors enable peoples and their allies to be better informed and to denounce abuses more quickly.

© Eric Mindling (ericmindling.com)

Noemí Martínez proudly models her indigenous costume in front of her home in Tierra Caliente, Tamazulápam, in Oaxaca, Mexico. Today, many indigenous people, especially youth, choose to wear more generic clothing.

María Jiménez, a potter in Tlahuitoltepec, carries her wares to market, wearing a blouse adorned with sacred xaamnïxuy *motifs. She is photographed in the corn field she cultivates with her husband and children.*

For example, between 2012 and 2019, the non-governmental organization Impacto – which campaigns for the rights of indigenous peoples – documented at least thirty-nine cases of plagiarism in the field of textiles by twenty-three fashion brands around the world. Such practices are regularly exposed in the media.

Yet, the abuses continue, and sanctions are extremely rare. The affected communities can only watch helplessly as local companies, the industry, and major international brands exploit the "ethnic" fashion trend, because there is no apparent ownership or legal protection. Examples of this appropriation continue to grow, without anyone seeming to care – leading to increasing feelings of injustice, indignation and dispossession among those exploited.

Part of the problem lies in the fact that the intellectual and industrial property laws of the World Intellectual Property Organization (WIPO) and the claims of aggrieved indigenous peoples are based on diametrically opposed philosophies and world views – in which the concepts of property and heritage are viewed and experienced in different ways.

> "Abuses continue, and sanctions are extremely rare"

In this context, the recent reform of the Mexican Federal Copyright Law is a step in the right direction. Approved in January 2020, the new provisions provide for the removal of works of folk art and handicrafts from the public domain, and guarantee them the same protection and respect as any literary or artistic work.

In addition, in order to exploit, market or industrialize works of traditional art, it will now be necessary to request authorization from the communities that own them. A safeguarding law that would sanction the unauthorized use (plagiarism) of elements of the culture and identity of peoples and communities, is also currently under discussion. This legal text will create a system for the protection, defence, identification, documentation, research, promotion, valorization, transmission, and revitalization of these elements at the federal, state and municipal levels.

This is a first step, but an important one on the long road towards taking better account of the rights and interests of indigenous communities.

OUR GUEST

An expert in sustainable urban development, Camille Ammoun's work aims at making cities more liveable and more resilient. He is also an author, who explores ways to address urban issues through literature. His latest book, *Octobre Liban* – which takes readers on a walk through the streets along the port of Beirut – is an uncompromising portrait of a city with a convulsive history. The story ends with the August 2020 explosion that destroyed entire districts of the capital and has caused lasting trauma to its inhabitants.

Interview by Laetitia Kaci

UNESCO

● In *Octobre Liban* (Lebanese October), you walk along a street in Beirut, beginning with the protests in October 2019 demonstrations and ending with the explosion on 4 August 2020. What did you observe, as a writer and urban planning specialist?

This text was born out of the October 2019 demonstrations, when I was walking along the street that runs along the port, and has three names: Rue d'Arménie, Rue Gouraud, Rue Émir-Bachir. It was also nourished by my memories of the city. In fact, the desire to convert my wanderings into a book predates autumn 2019.

Beirut is a city in motion that slowly rebuilt itself after the civil war (from 1975 to 1990). Its neighbourhoods have gradually and organically regained an economic vitality driven by small shops and craftsmen. In the mid-2000s, the districts of Gemmayzeh, and later, Mar Mikhäel, became the epicentre of Beirut nightlife and the source of unbridled artistic creativity – while Bourj Hammoud remained the economic heart of the city.

This spontaneous recomposition of the urban fabric has occurred in all the neighbourhoods bordering this street. All, except one: the historic city centre. Rebuilt by a private realtor, it illustrates the inability of real estate capitalism to make a city. The last stage of the narrator's wanderings, this city centre is totally disconnected from the rest of the city today. Yet, in October 2019, when the inhabitants took it over with their protests, it became the beating heart of the revolution.

While telling the story of this walk through the prism of the October demonstrations, a new perspective came to me. From the Bourj Hammoud rubbish dump on the outskirts, to the seat of government perched on the Kantari hill, the distance is just over four kilometres. Yet this is enough to measure the tragic nature of the city and the way in which the country, like a sleepwalker, has walked towards its ruin.

The Beirut River, which receives the city's wastewater before discharging it into the Mediterranean, the destruction of the Grande Brasserie du Levant [the Middle East's

© Lamia Ziadé

Camille Ammoun :

"Beirut is a city that is fighting, a wounded city, a tired city"

An illustration depicting the destruction of the headquarters of state power company Electricité du Liban after the explosion.

© Camille Ammoun

Terrace of the Chase café in Ashrafieh, one of Beirut's oldest districts, October 2020.

© Camille Ammoun

One of the towering cement silos in Beirut's port that was gutted by the force of the explosion, photographed on 26 August 2020.

oldest brewery] by a real estate developer, the abandoning of the [Mar Mikhäel] railway station when all the surrounding roads are congested, and, of course, the port of Beirut, are all symptoms of the evils eating away at the city.

The main character of this story is not the narrator, but the street he walks along. I had to write this text in spite of the collective astonishment, in spite of the astonishment of having survived, in spite of the mourning, in spite of the sadness, in spite of the anger.

One of the historic buildings on Rue Gouraud, Gemmayzeh. Photographed in May 2019, before the explosion, it is an example of vernacular architecture.

© Camille Ammoun

I had to write it, because on 4 August 2020 at 6.07 p.m., in that dreadful explosion, on that street, this character dies.

How would you define the uniqueness of the Lebanese capital?

I don't think Beirut is unique. Like many cities in the world, it is marked by community and social divisions, a disintegration of the urban fabric driven by property developers and corruption. It suffers from a lack of urban planning, is polluted, and lacks public spaces and efficient transport. If there is something unique about this city, it is perhaps the fact that it combines all these phenomena and offers an exacerbated version of them.

In what way have the inhabitants reappropriated this city? How do they inhabit it now?

During the mass demonstrations of autumn 2019, the Lebanese reappropriated certain public spaces such as the Martyrs' Square and the Riad El Solh Square in Beirut. Coffee vendors, roasted corn-on-the-cob vendors, second-hand bookstalls, all appeared there. Iconic buildings such as The Egg or Beirut's Grand Théâtre were occupied, and used differently. Tents were erected, and a veritable agora [a public open space] was created. A thirst for knowledge, understanding and expression was reborn. Life returned to the city's empty centre.

Roads across the country were also blocked by the demonstrators. In Jal el Dib, for example, a section of the northern highway – a vital artery leading to the capital – was occupied by its inhabitants. These actions were heavily criticized. They were seen by some as the cause of the paralysis of the Lebanese economy. In reality, it was the only way the inhabitants could find to express their anger and frustration. In doing so, they created public spaces ex nihilo [out of nothing] in a city which is cruelly lacking in them.

These are places where social bonds are forged, where people can meet and find each other. They are all the more essential now that property developers are in the process of tearing down the city. The buildings that make up the urban fabric are increasingly giving way to buildings with car parks on stilts. In a city without a ground level, people stop wandering or strolling around – letting chance guide their steps, and making random encounters. It is precisely these encounters and wanderings that form the core of a city's artistic activity and creativity, and give it its soul.

While Beirut's city centre is already a museum-like and unaffordable space, the rest of the city also threatens to become a city of parking lots on stilts. It is urgent that measures be taken to safeguard its urban stratification, its history, culture, and way of life.

Beirut has gone through multiple crises in the past decades, but it has always managed to recover. What explains this resilience? Has it been undermined by this latest ordeal?

"Beirut has died a thousand times and been reborn a thousand times," writes the poet Nadia Tuéni. Her words echo a popular legend: "Beirut has seven times been destroyed, and seven times rebuilt". For years, we've talked about the Lebanese as always being able to rise again. But the apocalypse of 4 August has overwhelmed this legendary

> “What is at stake in the reconstruction is maintaining the social fabric of the historic districts”

© Camille Ammoun

The Egg, the iconic building in downtown Beirut, being taken over by the city's inhabitants in October 2019. Once a grand modernist cinema, it was built in 1965.

resilience. We are not resilient and we are not all right. That's what messages exchanged on social networks after the explosion simply stated: "We are not ok!".

A resilient city succeeds in maintaining its urban continuity in spite of hardships. Until then, Beirut always seemed to recover, but with the price of many scars. It is not a resilient city, it is a city that is fighting, a wounded city, a tired city. And today it is only a shadow of its former self, a shadow of the city it could have been. Entire districts of the city centre were razed to the ground in 1990, historic buildings were destroyed by property developers – and then by the explosion of 4 August. What is lost is lost forever.

What are the most visible scars left by the explosion that destroyed parts of the city?

First of all, there is the trauma that has haunted the people of Beirut since the explosion. It may not be visible, but it is powerful. A total of 300,000 people lost their homes and had to find shelter with relatives. The rebuilding will take time.

On the physical level, the areas that have suffered the most are neighbourhoods with great social diversity, and a large number of buildings belonging to Beirut's architectural heritage. According to Jad Tabet, president of the Lebanese Federation of Engineers and Architects, thirty-two of these buildings are completely destroyed and 300 more are at risk of collapse. Their sandstone walls, arches, wooden frames and tiled roofs, the woodwork on their façades, and the marble on their balconies, did not withstand the impact of the explosion.

In spite of their gentrification, the districts of Mar Mikhäel and Gemmayzeh have retained a high level of social diversity, due to the rent controls that have allowed the original inhabitants to stay there. What is at stake with the reconstruction is maintaining the social fabric of these districts, their economic dynamism and creativity.

How do you envisage the reconstruction?

In order to avoid repeating the mistakes of the past and to prevent developers from preying on these neighbourhoods, it is essential to establish a legal framework for the reconstruction and restoration of the areas affected by the explosion. Urban governance must involve the inhabitants, taking into account their opinions, their practices, and the way in which they view their city. Without effective, enlightened and inclusive urban governance, the city of Beirut – well beyond the areas damaged by the explosion – will continue its slow decline.

There is reason for hope. In spite of its setbacks, in spite of the destruction, Beirut retains an extraordinary urban potential, thanks to its dynamism, culture, creativity, demography and geography – but also by what it evokes in the collective imagination. Today, this urban potential must be able to express itself fully, and those who bear this creativity must be able to take decisions.

Inside the Beirut Egg, which is now covered in graffiti by street artists.

© Camille Ammoun

The pandemic: Culture and tourism in the eye of the storm

Mila Ibrahimova

UNESCO

The Covid-19 health crisis has plunged the global economy into recession. Among the hardest hit are travel and tourism, one of the world's largest industrial sectors, and culture.

The United Nations' World Tourism Organization (UNWTO) has projected a sixty per cent to eighty per cent decline in international arrivals for 2020 – compared to a four per cent drop after the economic crisis in 2008. As tourism generates foreign exchange, stimulates regional development, directly supports numerous types of jobs and businesses, and underpins many local communities – especially in developing countries and Small Island Developing States – restarting this sector is a major concern for governments around the world.

The culture and tourism industries represent about 330 million jobs globally. Today, one in ten jobs are affected by the pandemic, with migrant workers, young people and women constituting a significant proportion of this workforce.

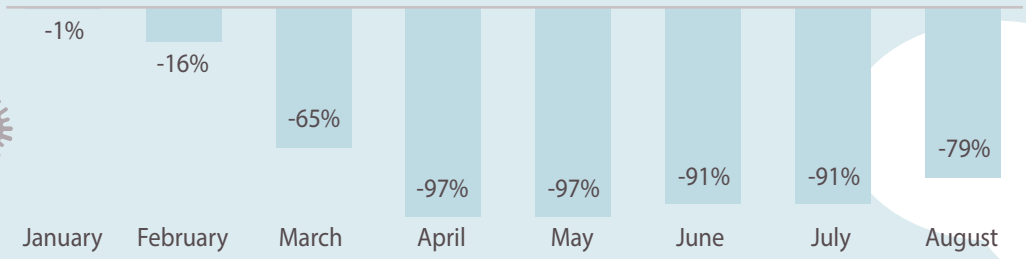
Cultural tourism makes up nearly forty per cent of global tourism revenue, with World Heritage sites and museums often serving as focal points for visitors. In March-April 2020, at the height of the global lockdown, which is beginning to ease in some regions, ninety-five per cent of museums remained closed – as many as thirteen per cent may never reopen. In nine out of ten countries, World Heritage properties also closed. The closure of these institutions and monuments inevitably lead to staff cuts and job losses.

Many intangible cultural practices have also been disrupted, impacting not only the cultural lives of communities, but also those working in the performing arts and traditional crafts. In addition, workers in the creative sector – such as theatres, art galleries and gastronomic restaurants have also been hit hard.

INTERNATIONAL TOURISM IN 2020

Source: UNWTO (2020)

Change by month, compared to 2019

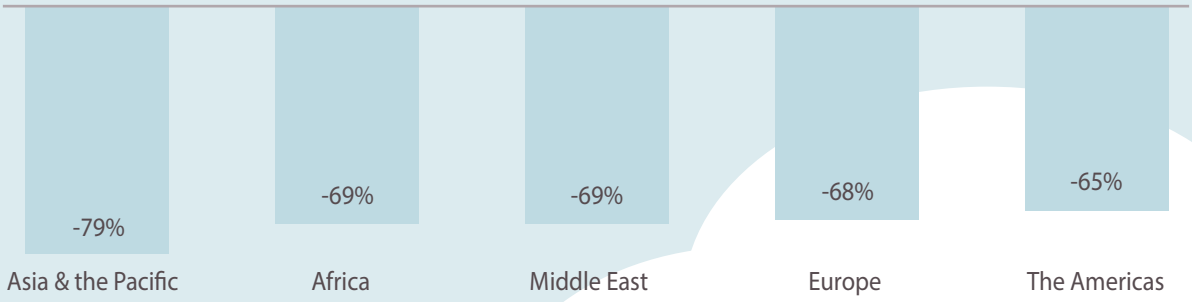


International tourist arrivals

2019
1.5 billion
(+4%)

2020
January-August
-70%

Decline of arrivals by region in 2020, compared to 2019



TOURISM & THE GLOBAL ECONOMY

2019 Global tourism sector

$8.9 trillion contribution to the world's GDP

10.3% of global GDP

330 million jobs

1 in 10 jobs around the world

144 million jobs at risk by December 2020

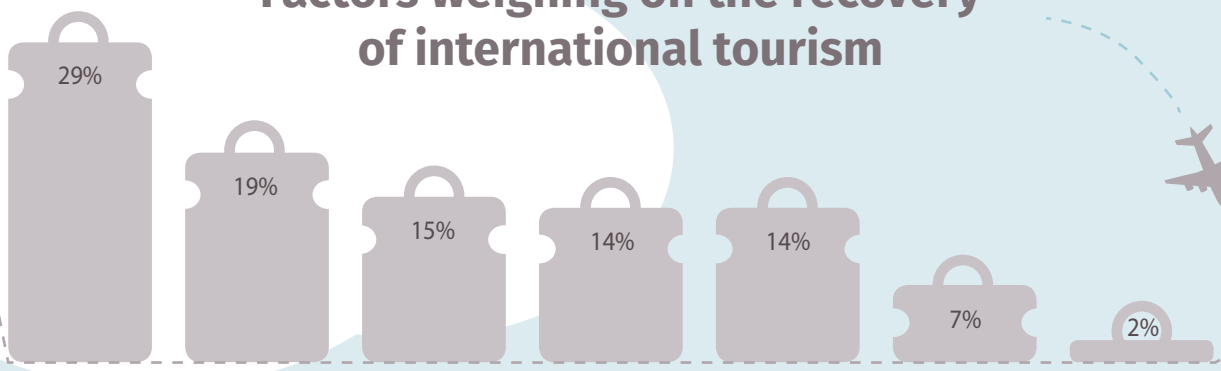
Most vulnerable groups

Women in low-skilled or informal work

Youth

Indigenous peoples and other historically marginalized populations

Factors weighing on the recovery of international tourism



Travel restrictions | Slow virus containment | Low consumer confidence | Economic environment | Lack of co-ordinated response among countries | Slow flight resumption | Other

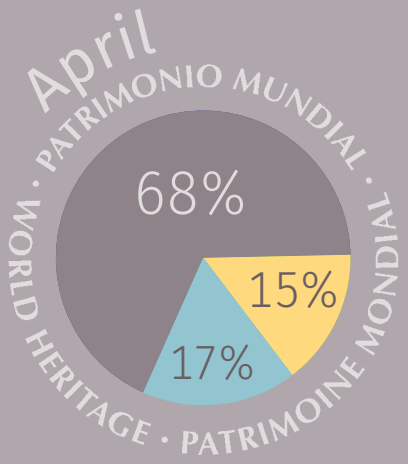
Sources: UNWTO (2020), The World Travel & Tourism Council (WTTC)

2020

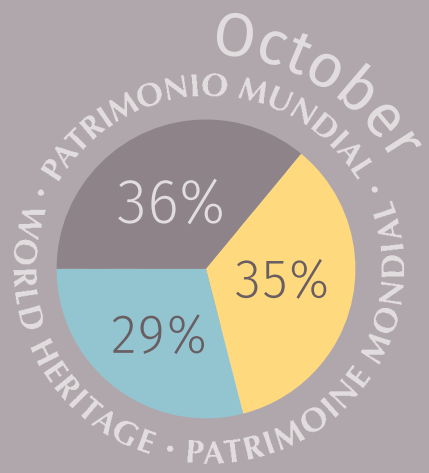
CULTURAL IMPACT OF COVID-19

Source: UNESCO (October 2020)

9 out of 10 countries
closed access to their
World Heritage sites

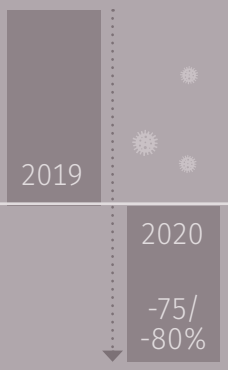


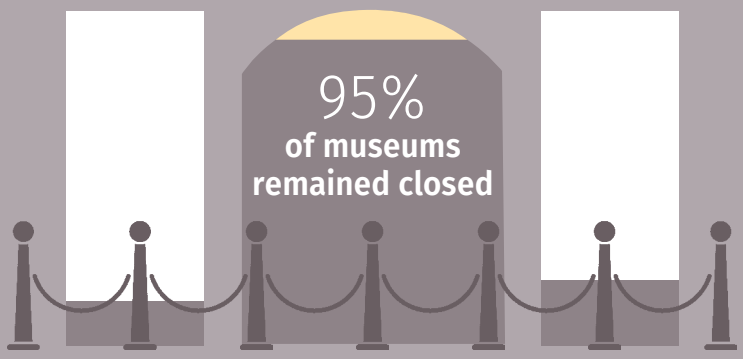
- closed sites totally
- kept their sites open
- partial closure indicated



Source: UNESCO (2020)

75% to 80%
loss of income for many museums





95% of museums remained closed

13% may never reopen

19.2% uncertain whether they would be able to continue

UNESCO Publishing

New publications

World Heritage No.96
Biodiversity

ISSN 1020-4202
EAN 3059630101967
60 pp., 220 x 280 mm, paperback, €7.50
UNESCO Publishing/Publishing for Development Ltd.

This issue was published to coincide with the UN Biodiversity Conference (COP 15), planned for October 2020 in Kunming, China, where many far-reaching decisions concerning the preservation of biodiversity were to be taken.

We explore some World Heritage sites with amazing biodiversity and discover the significant steps the Convention on Biological Diversity recommends we take in the coming decade, to conserve the web of life.

Global Ocean Science Report 2020
Charting Capacity for Ocean Sustainability

ISBN 978-92-3-100424-7
249 pp, 215 x 280 mm, paperback, €55
UNESCO Publishing

The world's oceans are a life-supporting system for humanity, yet they remain largely unknown.

Based on data collected from around the world, the *Global Ocean Science Report 2020* offers a record of how, where and by whom ocean science is conducted. It monitors our capacity to understand the ocean and seize new opportunities.

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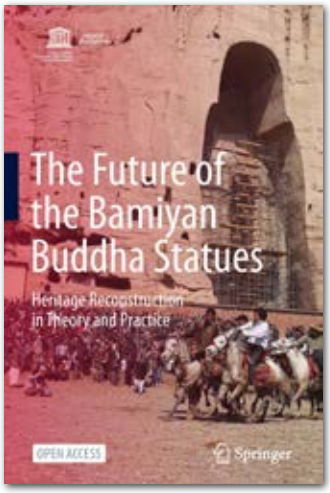

The Future of the Bamiyan Buddha Statues
Heritage Reconstruction in Theory and Practice

ISBN 978-92-3-100419-3
364 pp, 170 x 240 mm, hardback, €49.99
UNESCO Publishing/Springer

Structured around seven themes, the publication combines the latest thinking on heritage reconstruction ethics with the practical realities of implementing such decisions in a post-conflict setting. It also includes technical proposals of the future treatment of the Bamiyan Buddha statues.

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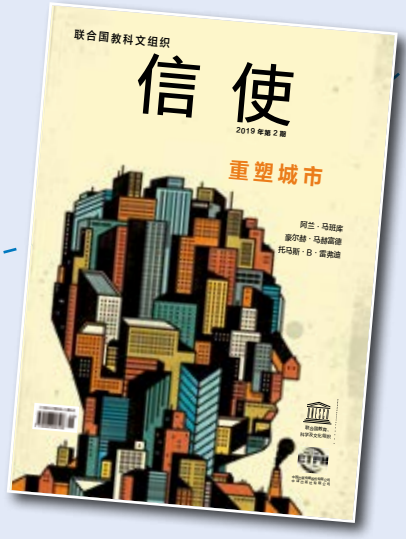

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